# ENGINEERING AND MINING JOURNAL

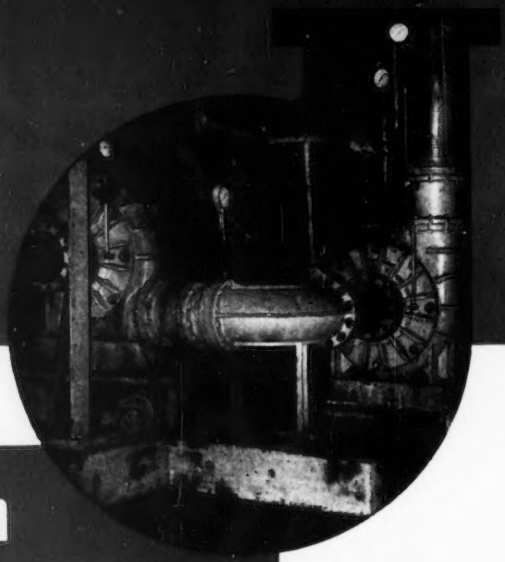
A McGRAW-HILL PUBLICATION

DECEMBER 1954

PRICE FIFTY CENTS

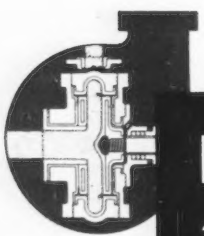
FOUNDED 1866

# LONG-RANGE BUDGETING calls for Hydroseals



**They maintain initial higher efficiency throughout longer life**

**1/3 to 1/2 saving in power costs**



**Flexible in application**

**Economical replacement of Maximix Rubber parts**

Write for Hydroseal Catalog No. 953.

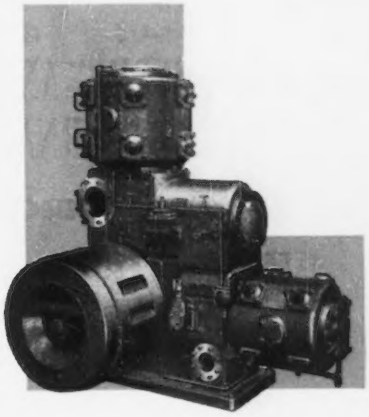
**THE ALLEN-SHERMAN-HOFF PUMP CO.**
**Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.**
*Representatives throughout the World*

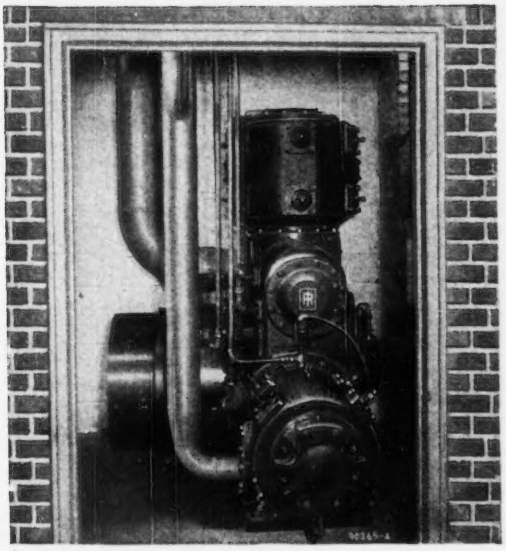
# HYDROSEAL and CENTRISEAL
**SAND, SLURRY & DREDGE PUMPS**

MAXIMIX RUBBER PROTECTED

# MORE AIR POWER in less floor space

*That's one of the many advantages offered by this space-saving* **XLE** *compressor:*





*A bronze company squeezed this XLE into a small, unused storage room.*

**Packaged design** for minimum floor space, and specially balanced for minimum foundation... ideal for skid-mounting.

**Easy to operate**... push button starting, grouped controls, automatic force-feed lubrication, automatic condensate removal, automatic air-operated starting unloaders and capacity control.

**Easy to install or relocate**... ready-to-run, assembled shipment ... simplified air and water piping.

**Easy to maintain**... simplified long-life construction... full-floating, cool-running, aluminum-alloy bearings that require no adjustment... no need to open the sealed crankcase which stays clean inside... streamlined exterior also easy to keep clean.

**Low operating costs**... new high-efficiency, long-life I-R Type A Channel Valves result in compressor efficiency comparable to the largest units... durable, high-efficiency tube-and-fin intercooler saves water... efficient direct-connected motor.

**Built for reliable, continuous full-load service**... sizes 125, 150, 200, 250, 300, 350 horsepower... discharge pressures 80 to 125-psi, two stage... write for more information today.

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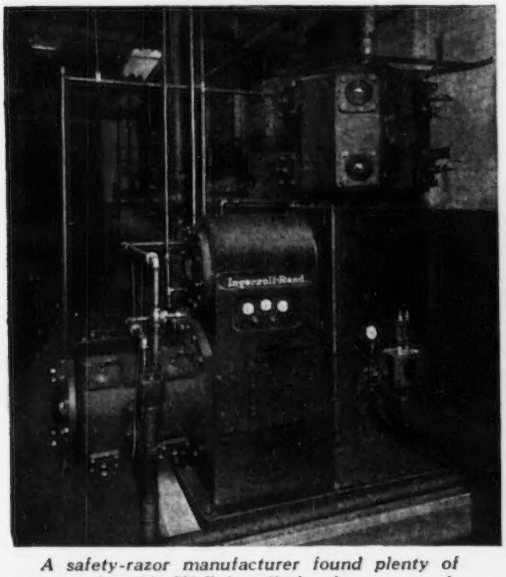
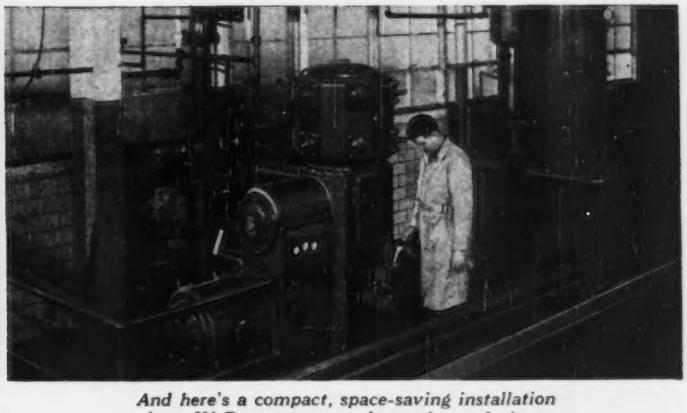
TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS
DIESEL AND GAS ENGINES



*A safety-razor manufacturer found plenty of space for this XLE installation in a screened-off basement corner.*



*And here's a compact, space-saving installation of an XLE compressor, aftercooler and air receiver in a tool plant*

# ENGINEERING AND MINING JOURNAL

88th YEAR OF PUBLICATION

VOL. 155 NO. 12

**DECEMBER 1954**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# LETTERS

### We Err; It's Fir

SIR:

Caption under the picture on p 123 (This Month in Mining, *E&MJ*, October 1954) states that it is . . . "the traditional pine tree" being placed atop the first load of ore from Oliver Iron Mining division's . . Plummer mine.

The tree pictured is certainly not a pine. It appears to be a fir, and coming from Minnesota, it is probably a balsam fir.

RICHARD W. SMITH, *Manager*
*Natural Resources Dept.*
*U. S. Chamber of Commerce*
*Washington, D. C.*

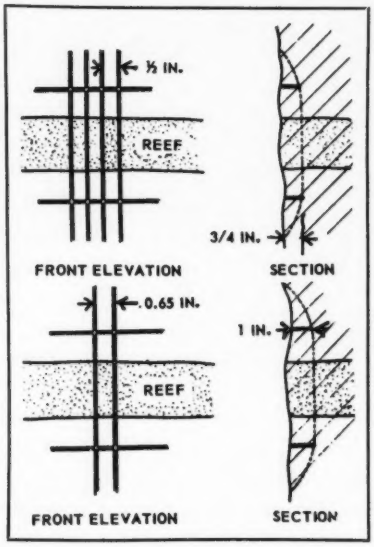
SIR:

It appears (you) erred a bit in calling a plain or swamp spruce, or at best a balsam, a pine tree . . .

PAUL C. ZIEMKE
*Oak Ridge, Tenn.*

*Ed: Readers Smith and Ziemke are correct. And it's the last time we'll go out on a limb like that.*

### Channel Sampling



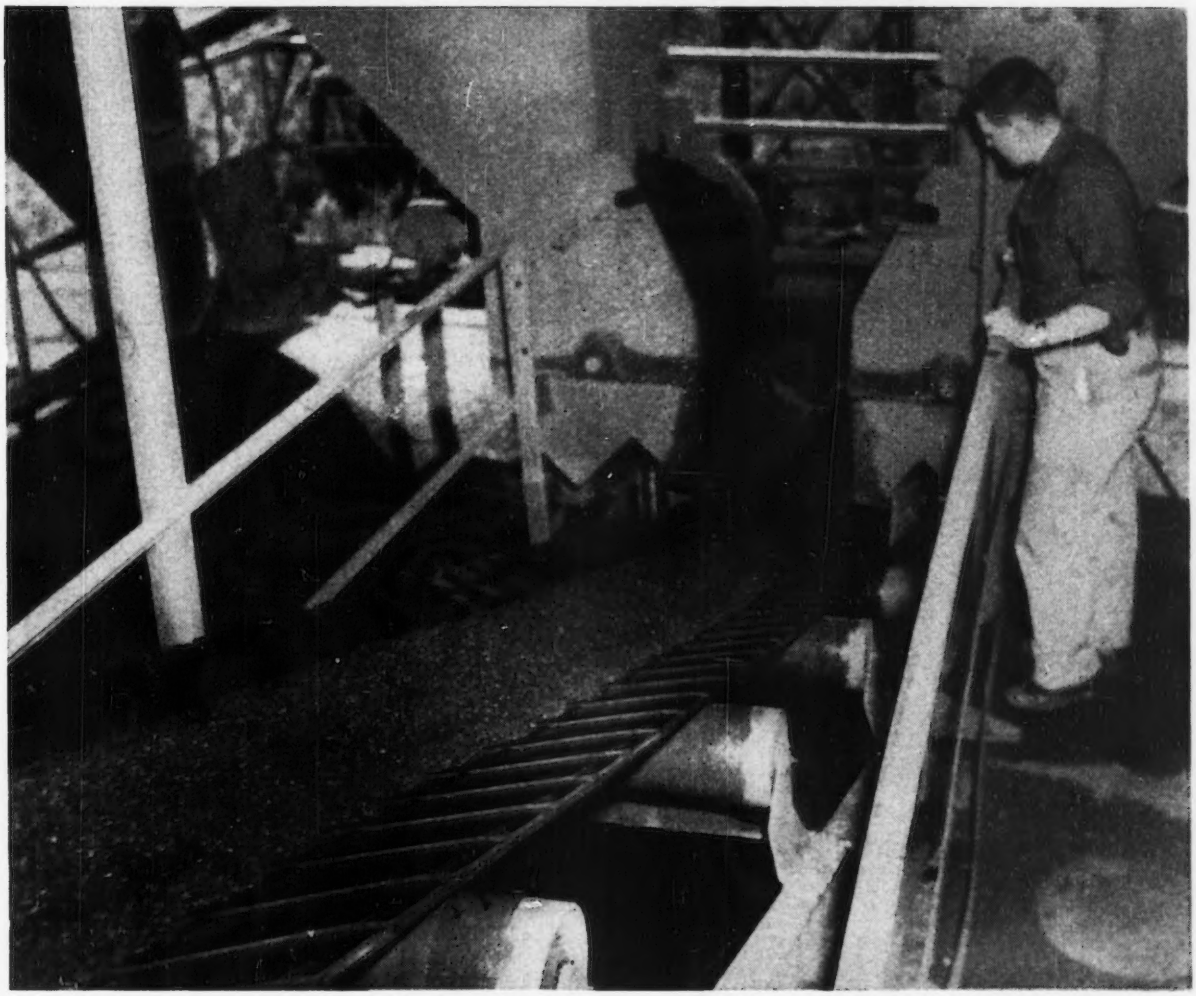

SIR:

On p 105 of your "How to Improve Mine, Mill and Smelter Operations" you mention channel sampling with diamond impregnated wheels. We would appreciate having the address of the people directly concerned with its development.

S. W. HOLMES, *Chief Geologist*
*Pronto Uranium Mines, Ltd.*
*Algoma Mills, Ont., Can.*

*Ed: The article originated with John Q. St. Clair, who recently opened a consulting office with R. J. Crowley at 439½ Main St., Grand Junction, Colo. Cut above illustrates two St. Clair sampling methods.*

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



# Rubber belt drains off water to speed ore washing

RIDING up that conveyor belt is crushed iron ore, still sopping wet from the washing that removes sand or silica.

As you can see, this is no ordinary belt. If it were, water seeping down through the ore would form a pool at the bottom of the belt trough, and wash the ore down the 20° incline. That's why the Riffle Grip belt you see here was recommended by B. F. Goodrich.

You'll notice that the Riffle Grip belt has a series of rubber ridges molded into the cover. It's this tread with angular steps that holds the ore in place, and, at the same time, channels water to the edges of the belt where it flows off.

B. F. Goodrich engineers developed this belt to solve a gold dredging problem. And it is such an improvement over ordinary belts that it's now widely used in mining operations, sand and gravel plants, and other places where wet materials must be carried up steep inclines.

This same belt works equally well on jobs where moisture must be *held*. By changing the incline angle and the troughing idlers, the steps become a series of horizontal ribs which can carry such sloppy materials as wet mixed concrete and keep the water from draining away.

With its ability to shed water or retain it, as the job requires, the B. F. Goodrich Riffle Grip belt is making many mining and processing jobs cheaper, more efficient. Your BFG distributor will give you complete details on how this unusual belt can solve your wet material handling problems. Or write *The B. F. Goodrich Company, Dept. M-342, Akron 18, Ohio.*

**B.F.Goodrich**
**INDUSTRIAL PRODUCTS DIVISION**

TUNE IN:
TEXACO STAR THEATER
starring JIMMY DURANTE
or DONALD O'CONNOR,
on TV Saturday nights.
METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

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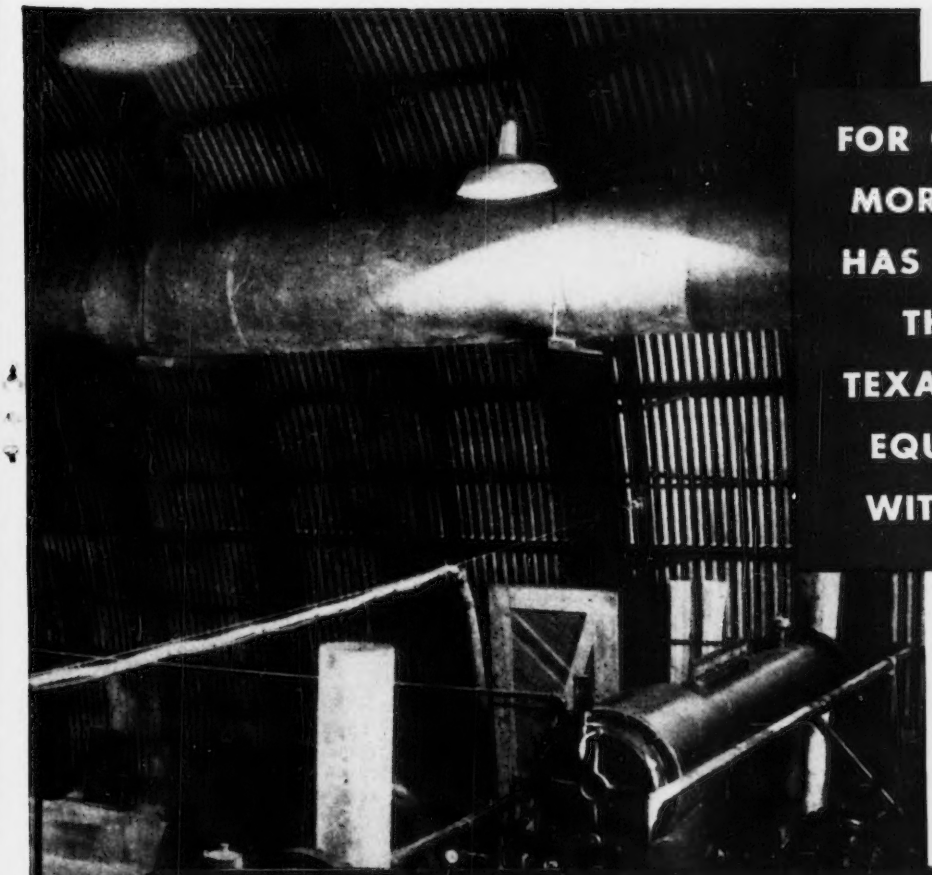

**FOR OVER 20 YEARS MORE COPPER ORE HAS BEEN MINED IN THE U. S. WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER.**

**YOU CAN** be sure of keeping your air compressors and lines clean — free of harmful deposits and rust — when you lubricate with *Texaco Regal Oil R&O*. Valves, too, will stay clean and piston rings free for top-efficiency performance.

*Texaco Regal Oil R&O* is made from the choicest selected crudes painstakingly refined to make an oil of basically superior quality — then *made even better* by the addition of highly effective rust and oxidation inhibitors and special treatment to prevent foaming.

There is a complete line of *Texaco Regal Oils R&O*. Thus, whatever the size or type of the compressor, whatever the number of stages or pressure involved, whatever the operating conditions, there is a *Texaco Regal Oil R&O* exactly right to assure highest operating efficiency.

To guard drills against wear and rust, use *Texaco Rock Drill Lubricant EP*. Its extreme pressure properties protect your drill for longer life, keep maintenance expense exceptionally low.

Let a Texaco Lubrication Engineer help you select the proper lubricants for your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

# Lubricants and Fuels

## FOR THE MINING INDUSTRY

KOEHRING COMPANY
Milwaukee 16, Wis.
Subsidiaries: JOHNSON
PARSONS • KWIK-MIX

## Measure excavators by

# price per pound of lifting capacity

In analyzing shovel operation, you will find that price per pound of lifting capacity on crane rating is also an excellent measurement of excavator value.

Remember, lift capacity is *work capacity*. Obviously, the machine with the heaviest lift rating not only picks up larger crane loads — it also has more strength, extra speed and stability to handle bigger loads faster with every excavator attachment.

Check Koehring lift ratings shown below — then ask your Koehring distributor to give you the figures on price per pound of lifting capacity.

## Compare for yourself:

| KOEHRING MODEL | SIZE DIPPER | KOEHRING LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load) | | PRICE PER POUND OF LIFT CAP.* |
|---|---|---|---|---|
| 205 CRAWLER | ½-Yd. | 20,000 lbs. | 30-foot boom at 10-ft. radius | ? |
| 205 ON RUBBER | ½-Yd. | 30,000 lbs. | 25-foot boom at 12-ft. radius | ? |
| 304 CRAWLER | ¾-Yd. | 27,800 lbs. | 35-foot boom at 12-ft. radius | ? |
| 304 ON RUBBER | ¾-Yd. | 50,000 lbs. | 30-foot boom at 10-ft. radius | ? |
| 405 CRAWLER | 1-Yd. | 40,000 lbs. | 40-foot boom at 12-ft. radius | ? |
| 605 CRAWLER | 1½-Yds. | 72,300 lbs. | 50-foot boom at 12-ft. radius | ? |
| 1005 CRAWLER | 2½-Yds. | 159,000 lbs. | 50-foot boom at 12-ft. radius | ? |

***Figures available on request—ask your Koehring distributor to see them.***

KOEHRING HEAVY DUTY

**BIG-PRODUCTION TEAM** — Loading rock, Koehring 1½-yard shovel (above) is teamed up with Koehring Dumpters.®

K431

# *For heavy duty mine cars,*

# the steel most suitable is

● During the period 1941 through 1946 the Resurrection Mining Company purchased 58 mine cars from C. S. Card Iron Works of Denver, Colorado. These cars, built of USS COR-TEN Steel, have been used to haul lead-zinc ore, and are still very usable.

USS High Strength Steels like COR-TEN, MAN-TEN and TRI-TEN can give your mining equipment built-in stamina to insure more productive time for your investment and less maintenance and repairs, all at surprisingly low cost. These famous "steels that do more" have a 50% higher yield point, and offer greater resistance to wear, fatigue, and impact than ordinary carbon steel. Thus, you can use USS High Strength Steels in the vital parts of your mining equipment to increase their strength and life *without* increasing their weight. When the use of thinner sections is feasible, these tough, strong steels can: (1) reduce equipment weight without reducing its strength; or (2) increase the size and capacity of equipment without increasing total weight or the power needed to move it.

If your equipment must operate under corrosive conditions or at sub-zero temperatures or must handle highly abrasive materials, USS High Strength Steels will give it resistance to these highly destructive forces. Used singly or in combination, USS High Strength Steels will make your equipment *more* productive, *less* in need of repair.

If you would like more information or application data about USS High Strength Steels write or call our nearest office.

*New book gives complete story of*

## USS COR-TEN steel

This 58-page book is filled with factual data about USS COR-TEN Steel. Contains many illustrations of interesting applications as well as physical properties and characteristics, and shows savings that can be affected through its use. Send for your free copy today.

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## USS High Strength Steels

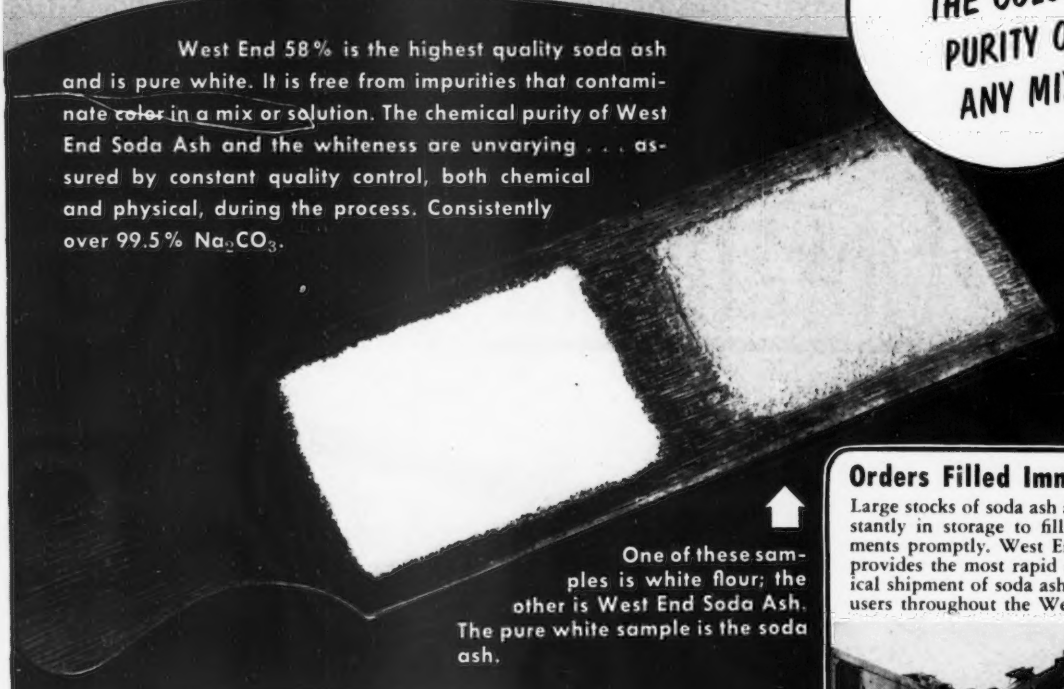
4-2073

UNITED STATES STEEL

# WEST END 58% SODA ASH IS PURE WHITE

...IT SAFEGUARDS THE COLOR PURITY OF ANY MIX!

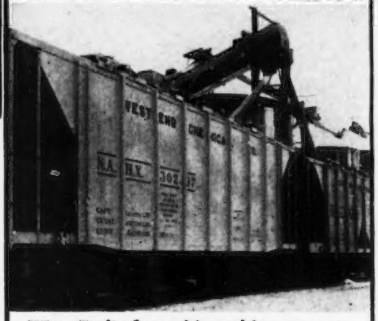
West End 58% is the highest quality soda ash and is pure white. It is free from impurities that contaminate ~~color~~ in a mix or solution. The chemical purity of West End Soda Ash and the whiteness are unvarying . . . assured by constant quality control, both chemical and physical, during the process. Consistently over 99.5% $Na_2CO_3$.



One of these samples is white flour; the other is West End Soda Ash. The pure white sample is the soda ash.

**Orders Filled Immediately**

Large stocks of soda ash are kept constantly in storage to fill all requirements promptly. West End's location provides the most rapid and economical shipment of soda ash available to users throughout the West.



West End's fleet of leased hopper cars is always ready to serve.

30 minute in-and-out loading for bulk trucks at any hour of day or night through "serve yourself" delivery.

**WEST END SODA ASH DISSOLVES FAST...IS OVER 99.99% SOLUBLE!**

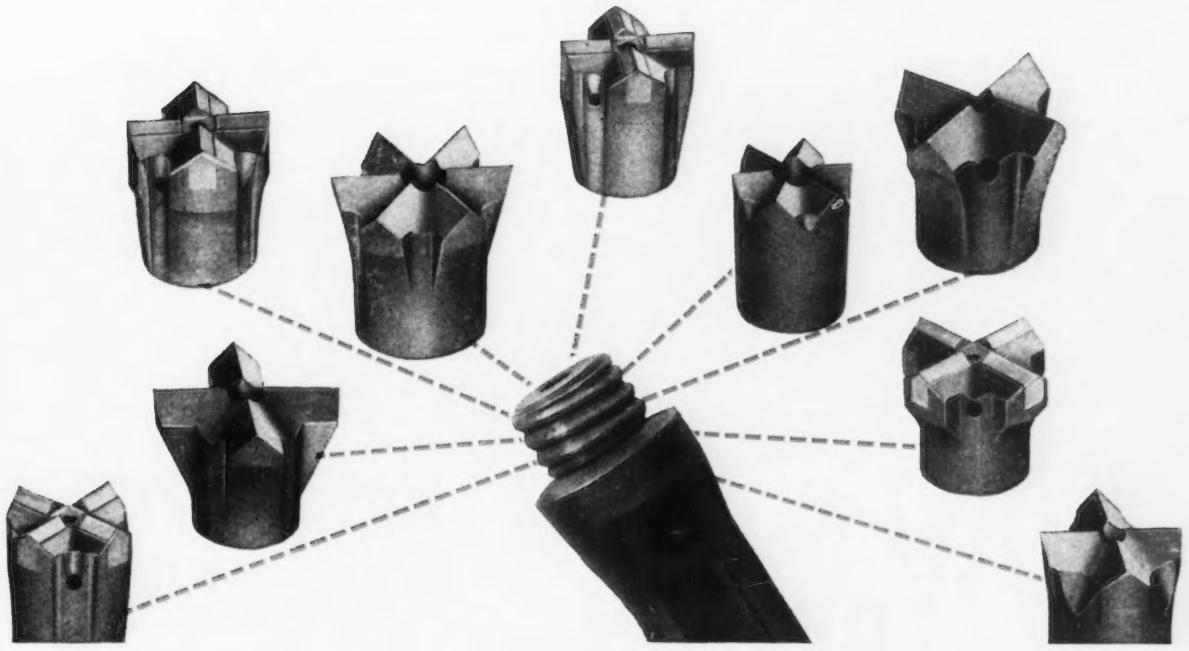
A far cleaner, more uniform product results from using this extremely soluble soda ash. West End ash is a minimum 58% $Na_2O$ and averages 58.25% or more. Insolubles that can contaminate mixes are never present.

*Write for samples, prices and technical data.*

Executive offices: 608 Latham Square Building, Oakland 12, California · Plant: Westend, California

# SAVE DRILLING TIME!

*Change bit types without changing drill steel!*



## *Dozens of different TIMKEN® carbide insert and multi-use bits fit the same drill steel!*

FOR the most economical drilling, it pays to change bit types as the ground changes. And this bit switching is most economical when you use Timken® carbide insert and multi-use rock bits—you don't have to change drill steels every time you change bit types. Dozens of different Timken carbide insert and multi-use bits are interchangeable on the *same* drill steel!

Drillers can unscrew one type of Timken bit and screw another bit on the same drill—right on the job! No time wasted going after another set of drill steels. No need to stock expensive double inventories.

With Timken interchangeable rock bits, you know your drillers can always use the most economical bit for the ground being drilled—Timken multi-use bits for ordinary ground, Timken carbide insert bits for hard, abrasive ground.

Both Timken carbide insert and multi-use bits give you two important advantages: 1) they are made from electric furnace Timken alloy steel, 2) a special shoulder union keeps drilling impact from damaging threads.

Our rock bit engineers may be able to help you with your drilling problems. They're experts in cutting drilling costs. There's no obligation. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

**WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS**

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

**WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS**

Give highest speed through hard, abrasive ground. Also most economical for constant-gage holes, small diameter holes, very deep holes.

***... your best bet for the best bit... for every job***

**TIMKEN**

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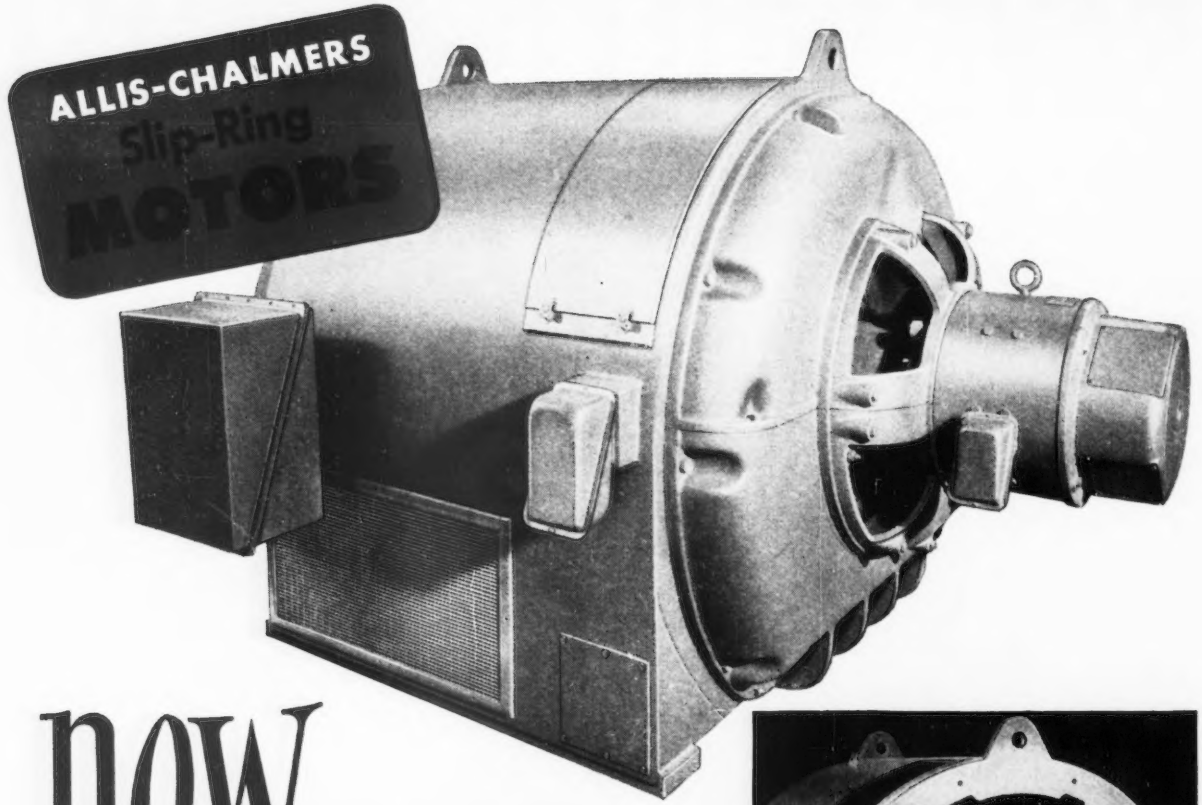
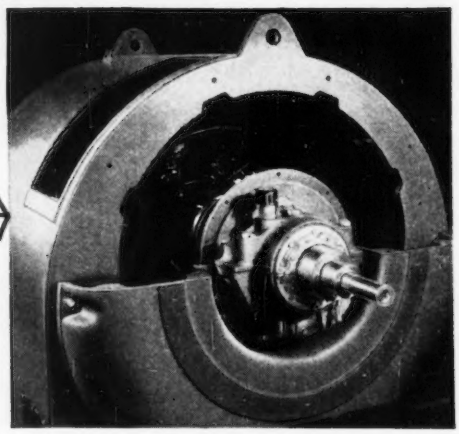



# new DESIGN...

## more protection with full accessibility



* New Allis-Chalmers slip-ring motor with inspection cover and upper half of end shield removed. Note accessibility of brushes, protection of bearing.

ALLIS-CHALMERS LARGE SIZE SYNCHRONOUS AND WOUND-ROTOR MOTORS have been completely redesigned with longer stator yokes and shorter end shields. Collectors and brushes are located inside the yoke for protection against physical damage, dripping moisture, dust and dirt.

Capsule-type bearings give better bearing protection, too. The upper half of the end shield may be removed for inspection or cleaning of the interior of the motor without disturbing the exciter or exposing the bearing to the ravages of dirt, dust and oil contamination.

**All leads enclosed** — Both primary and secondary winding leads are brought out through separate conduit boxes. There is no loose wiring . . . no exposed leads anywhere.

**Easy maintenance** — Even though the new design offers maximum protection to brushes and collectors, internal parts are fully accessible for inspection and maintenance through large openings in the stator yoke. Opening covers are readily removed and are secured during operation by easy-operating, self-locking fasteners.

**Get details now** — This new design is available from approximately 250 hp at 300 rpm and up, in drip-proof and splash-proof construction. Call your Allis-Chalmers representative for complete details or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 05R8183. A-4464

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Northwest brings you a combination of advantages found in no other similar equipment—the "Feather-Touch" Clutch Control for easy operation, Northwest Simplicity of Design for easier upkeep, Uniform Pressure Swing Clutches, Northwest Steering, Cast Steel Machinery Side Frames, the Cushion Clutch, the Northwest Dual Independent Crowd—all combine for greater output at lower cost. You can't have too much dependability where profits begin. You can plan to have Northwest performance. Why not talk it over with a Northwest man and let him tell you how?

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If you need rubber tired equipment, Northwest Truck Cranes bring you a combination of advantages in Crane and Carrier not found in other similar equipment. Get the details before you buy.

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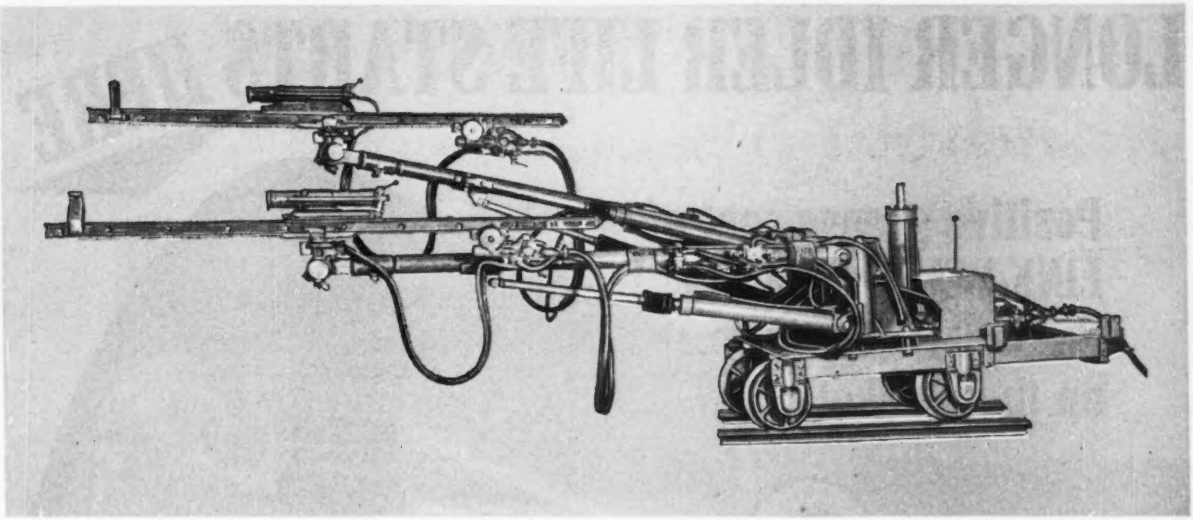
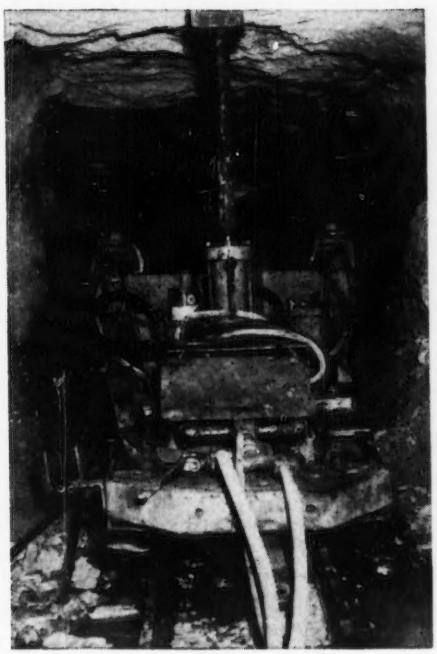


# "Can't find anything to beat the JOY JIB JUMBO"



Thus reports a mine operator who has "tried 'em all." He rated the Joy Jib Jumbo tops in drilling speed, safety, and driller comfort.

He found that only the Joy Jib Jumbo had *all* these features:

- Jibs are hydraulically actuated for faster, more flexible operation, and for greater rigidity when in place for drilling.
- Drills are operated by remote control which allows operator to stand well back from the face.
- Permits use of long chain feeds and long-wearing carbide insert bits.
- Speed in setting up and tearing down—hydraulic roof jack which brakes wheels in the only setting-up operation.

The versatility of the Joy Jib Jumbo and the variety of models available makes it applicable to your mining plans. Why not see for yourself today. Write for Bulletin 87-F to ***Joy Manufacturing Company Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

**for AIR COMPRESSORS, ROCK DRILLS, HOISTS, AND SLUSHERS**

W&D M5442

JOY

**WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT**

# LONGER IDLER LIFE STARTS *HERE*

## Positive grease seal of LINK-BELT IDLERS is the most effective on the market

NO BELT CONVEYOR IDLER is any better than its bearings. And no bearing outlasts its grease seals. That's why the seals on Link-Belt roller bearing idlers are so important to you.

The result of many years of intensive laboratory and field testing—the positive Link-Belt seal excludes dirt and moisture—retains lubricant. Felt and neoprene are combined with steel retainers and spacing collar to make an accurate cartridge labyrinth seal. There are no springs, no loose washers, no possibility of metal-to-metal contact.

And this is just one of the many engineering extras that make Link-Belt Idlers last longer. Check the box at right. Then ask your nearby Link-Belt office or distributor for a copy of new 48-page Book 2416. See for yourself how industry's most comprehensive line of idlers can mean lower handling costs for you.

### 6 other reasons why LINK-BELT IDLERS cut handling costs

1. **HUSKY, HIGHEST QUALITY BEARINGS,** free and easy turning, assure maximum life, minimum belt-wear, low power consumption.
2. **SAFE, CONVENIENT GREASE FITTINGS** provide ease of lubrication—lubrication for longer life.
3. **CONCENTRIC ROLLS** have smooth surfaces and rounded edges. Machine-made, continuous welds prevent entrance of dirt and moisture.
4. **OUTER SHELL COUNTERBORES AND COUNTERBORES AND JOURNAL** of the heavy 3/16" thick wall bearing retainer tubes with the press fits of the roll head assures hop-free rotation.
5. **STRONG, RIGID FRAMES** support rolls in perfect alignment. Rolls are securely held in place but can be easily removed for inspection and service.
6. **GROOVED HEX NUTS** lock into malleable brackets, creating truss effect—prevent shaft rotation and bracket spreading under both vertical and impact loads.

# LINK-BELT

**BELT CONVEYOR IDLERS**

**LINK-BELT COMPANY:** Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,522

# PULLING POWER

## by Goodman

## Tailored to fit the job like a glove!

This rugged locomotive is typical of hundreds built by Goodman for metal mine service, after a thorough study of job requirements.

Its over-all length was determined by a 12′ mine cage. 13 ton weight to provide good traction on wet track was requisite. A cable reel had to be provided for operation beyond limits of the trolley wire. Good visibility for the motorman over locomotive and high cars was important. All working parts and electrical units had to be fully protected from water and muck. Ample roadway clearance was imperative.

There were other requirements too, such as heaters on the sand box to keep the sand dry, and a handy foot-step for the motorman, to facilitate getting into and out of the cab. No detail was too small for full consideration.

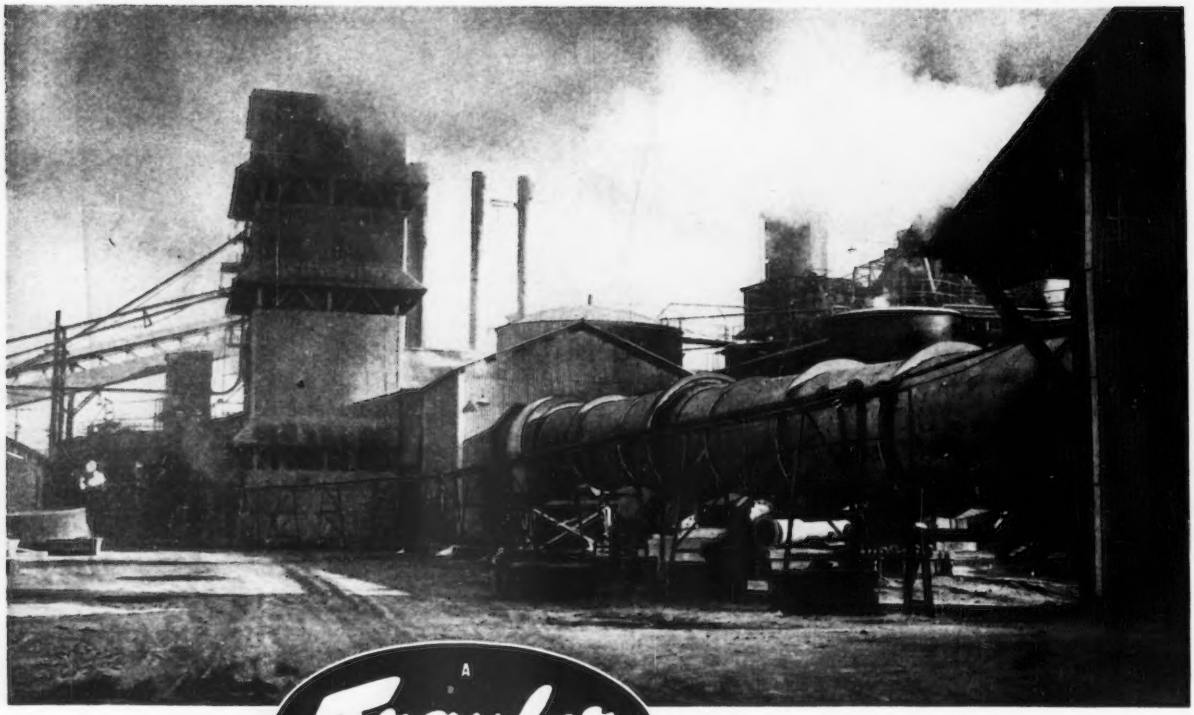
What Goodman has done for other mine operators, Goodman can do for you. We shall be glad to analyze your locomotive requirements—without obligation on your part.

**Goodman**
**MANUFACTURING COMPANY**
4834 S. Halsted Street • Chicago 9, Illinois

Cutting Machines Conveyors Loaders Shuttle Cars Locomotives Continuous Miners

# only one

## Rotary Kiln for Thermo-Processing is right for you



A **Traylor** LEADS TO GREATER PROFITS

**TRAYLOR ENG. & MFG. CO.**
**1612 Mill St., Allentown, Pa.**

**THERMO-PROCESSING** is a big part of my production cost. So, I need the most efficient equipment I can get. Send me your new bulletin 1115 on Traylor Rotary Kilns.

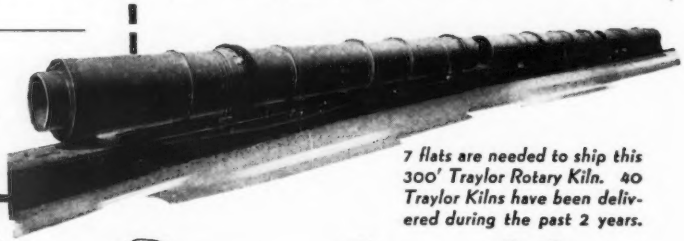
*Name* _____

*Company* _____

*Address* _____

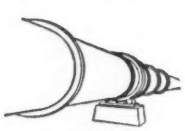
Sales Offices: New York • Chicago • San Francisco
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.

For greatest efficiency, a Rotary Kiln must be designed specially for its job. With all the possible variations of basic kiln design, it takes an expert to tell what's best for you. With hundreds of Traylor Kilns now in operation, Traylor engineers have built up a vast reservoir of experience to draw on in building your "Traylor-Made" Kiln.

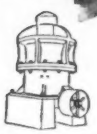


*7 flats are needed to ship this 300' Traylor Rotary Kiln. 40 Traylor Kilns have been delivered during the past 2 years.*

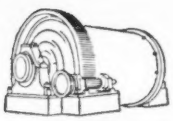
Primary Gyratory Crushers



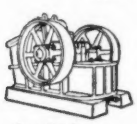
Rotary Kilns



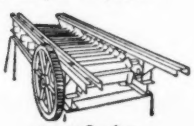
Secondary Gyratory Crushers



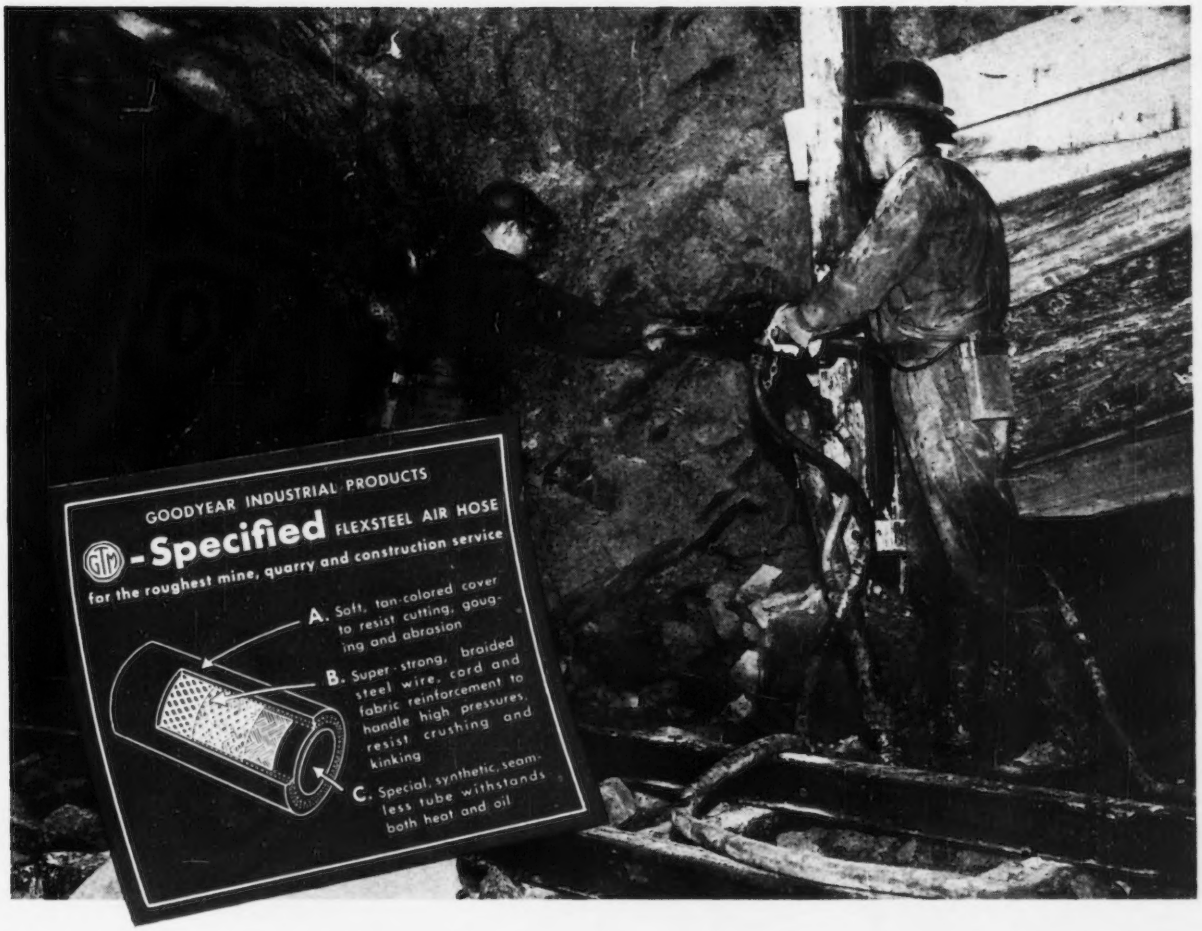
Ball Mills



Jaw Crushers



Apron Feeders


GOODYEAR INDUSTRIAL PRODUCTS
GM-Specified FLEXSTEEL AIR HOSE
for the roughest mine, quarry and construction service
A. Soft, tan-colored cover to resist cutting, gouging and abrasion
B. Super-strong, braided steel wire, cord and fabric reinforcement to handle high pressures, resist crushing and kinking
C. Special, synthetic, seamless tube withstands both heat and oil

# NEW, HIGH-PRESSURE AIR HOSE

## *–rugged, wire-reinforced FLEXSTEEL*

Brand-new, yet fully proved in rough, tough, underground mine service, is FLEXSTEEL – latest effort of the G.T.M.– Goodyear Technical Man – to give you lowest possible hose costs on every job.

FLEXSTEEL is a hose specifically designed for handling high-pressure air under extremely abusive external conditions. It is built with a special, heat- and oil-resistant tube, a soft, impact- and abrasion-resistant cover and is reinforced with super-strong, braided steel wire. But despite this rugged construction, it is relatively light in weight and surprisingly flexible.

Extensive tests on drill stands, drill jumbos and loading machines have proved FLEXSTEEL to be safer, easier-handling and longer-lasting—to withstand fully rough handling, dragging over sharp rock, even being run over by a loader. For details on FLEXSTEEL, see the G.T.M., your Goodyear Distributor or write: Goodyear, Industrial Products Division, Akron 16, Ohio

**Your Goodyear Distributor** *can quickly supply you with Hose, Flat Belts, V-Belts, Packing or Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

Flexsteel–T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR

**THE GREATEST NAME IN RUBBER**

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

# Increase your footage

## Use CLEVELAND Air Legs and Drills...the easiest way

### THE FEED YOU NEED — FROM ZERO FEED TO FULL LINE

Eleven detent positions enable drill operator to set and maintain pressures in a range from zero to full-line feeding pressure — with an increase of 9 psi at each setting. That's why a CLEVELAND Air Leg and H10AL Drill combination gives top performance in any kind of rock.

Shown here is a **CLEVELAND AL-92** Telescopic Air Leg with H10AL Drill. Because of space limitations, full length isn't shown

**CLEVELAND AL-92** Telescopic Air Leg with H10AL Drill and exclusive 11-position feed control

**SPECIFICATIONS**

Standard, automatic controlled wet-type backhead.

| | | |
|---|---|---|
| Chuck sizes | 7/8" x 4¼" — or other popular steel shank sizes | |
| Weight | 60 lbs. | |
| Air Hose | ¾" | |
| Water Hose | ½" | |
| Full feed travel | 4' | 6' |
| Collapsed feed | 2' ea. piston | 3' ea. piston |
| Closed length | 48" | 60" |
| Extended length | 96" | 132" |
| Air leg weight | 37 lbs. | 42 lbs. |

**CLEVELAND AL-90** Single Extension Air Leg for use with H10AL Drill and exclusive 11-position feed control

**SPECIFICATIONS**

| | |
|---|---|
| Weight | 60 lbs. |
| Air Hose | ¾" |
| Water Hose | ½" |
| Feed Travel | 36" — 48" — 60" |
| Closed Length | 56¾" — 69" — 81¼" |
| Extended Length | 92¾" — 117" — 141¼" |
| Air Leg Weight | 30 lbs. — 34 lbs. — 37 lbs. |

**CLEVELAND AL-91** Single-Extension Air Leg for use with any 35-lb., 45-lb., or 55-lb. class rock drill. Feed control built into air leg.

**SPECIFICATIONS**

Standard wet, or automatic controlled, wet-type backhead available.

| | |
|---|---|
| Air hose | ¾" |
| Water hose | ½" |
| Feed travel | 36" — 48" — 60" |
| Closed length | 58" — 71" — 83" |
| Extended length | 94" — 119" — 143" |
| Air leg weight | 35 lbs. — 38 lbs. — 41 lbs. |

# per man-shift!

## to drill rock

**Choose the drilling combination that's best for you from the industry's only complete line of telescopic or single-extension air legs.**

MINERS like to use a CLEVELAND Air Leg and H10AL Drill combination. It gives them real flexibility — they can use it as a drifter . . . as a stoper . . . or as a hand-held drill . . . set-ups are quick and easy.

It's an easy-handling combination, also. The air leg supports the drill and absorbs fatiguing recoil. You get flexible feeding pressure, too — from zero to full line. That's why miners drill more footage with CLEVELAND, yet are less tired at the end of their shift.

Exclusive CLEVELAND built-in feed control in the H10AL Drill eliminates a third hose and cumbersome "Y" connections. There's no feed-control bleed valve — the operator doesn't have to bleed off air continuously, to maintain suitable feeding pressure. He can change or advance the position of the leg easily and quickly.

The air leg holds the drill in line with the hole — thus reducing front-end drill wear and practically eliminating rotation strains.

These are ways a CLEVELAND Air Leg and H10AL Drill combination helps you get more drilling for less cost. Take advantage of them.

Write today for Bulletin RD-30 for complete information.

**CLEVELAND AL-93** Telescopic Air Leg for use with any 35-lb., 45-lb., or 55-lb. class rock drill. Feed control built into air leg.

**SPECIFICATIONS**

| | | |
|---|---|---|
| Full Feed Travel | 4′ | 6′ |
| Collapsed Feed | 2′ ea. piston | 3′ ea. piston |
| Closed Length | 50″ | 62″ |
| Extended Length | 98″ | 134″ |
| Air Leg Weight | 42 lbs. | 47 lbs. |

**CLEVELAND ROCK DRILL DIVISION**
**Westinghouse Air Brake Co.**
**12500 BEREA ROAD • CLEVELAND 11, OHIO**

Plants: Milwaukee, Wisconsin • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Michigan

RD-59

## With the All-Motor Type,

# ALL-STEEL FALK Motoreducer

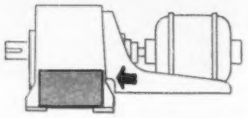
you can interchange motors in minutes... *on the job!*

## Fast, easy maintenance gives savings in time and money

With the *all-steel,* All-Motor type FALK Motoreducer . . . the only complete and compact motorized reducer with a separately mounted, resilient Steelflex coupling-connected motor . . . you can replace or interchange motors, *or even parts,* in minutes—*on the job,* without long and costly "down time"! Ratios can be changed (within capacity) without motor modification.

Any make, speed, or type of standard foot-mounted motor within the unit's AGMA rating is usable *without modification* on this All-Motor type Motoreducer. Motors with variable speed drive arrangement can be used, if desired. No "partial" motor or special shaft is required in event of motor replacement—simply use a complete motor, available for quick delivery from factory or local stocks without expensive delays.

Add to these exclusive maintenance-saving advantages the FALK "In-built" Factors, described at the right, and you have an unbeatable combination of quality, application adaptability, dependability, long-range economy, and dollar-for-dollar value. Write for Bulletin 3104.



**Every FALK Motoreducer has these "In-built" Factors—**

**Positive Lubrication.** Large sump capacity . . . oil-tight construction assures clean lubricant . . . direct dip of revolving elements provides positive lubrication at all speeds.

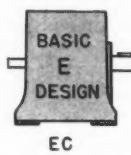
**Wide Speed Range.** Selective ratio combinations provide output speeds from 1.5 rpm to 1430 rpm with stock gears.

**Streamlined Inside and Outside.** Smooth, clean surfaces; machine welded construction conforms to NEMA motor frames.

**Sealed Housings.** Dual closures and one-way vents keep oil *in,* dust and moisture *out.* Units are splash-proof, leakproof, dustproof.

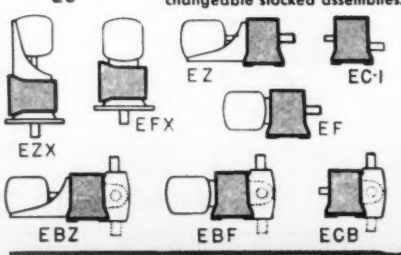
**Precision Gearing.** Heat treated alloy steel, precision cut and shaved helical gearing throughout . . . quiet-operating crown shaved pinions . . . taper bored gears for easy ratio changes.

**All-steel Housings.** Unbreakable, strong, rigid. Generous overhung load capacities provided by wide bearing spans, large shafts and bearings.




EC

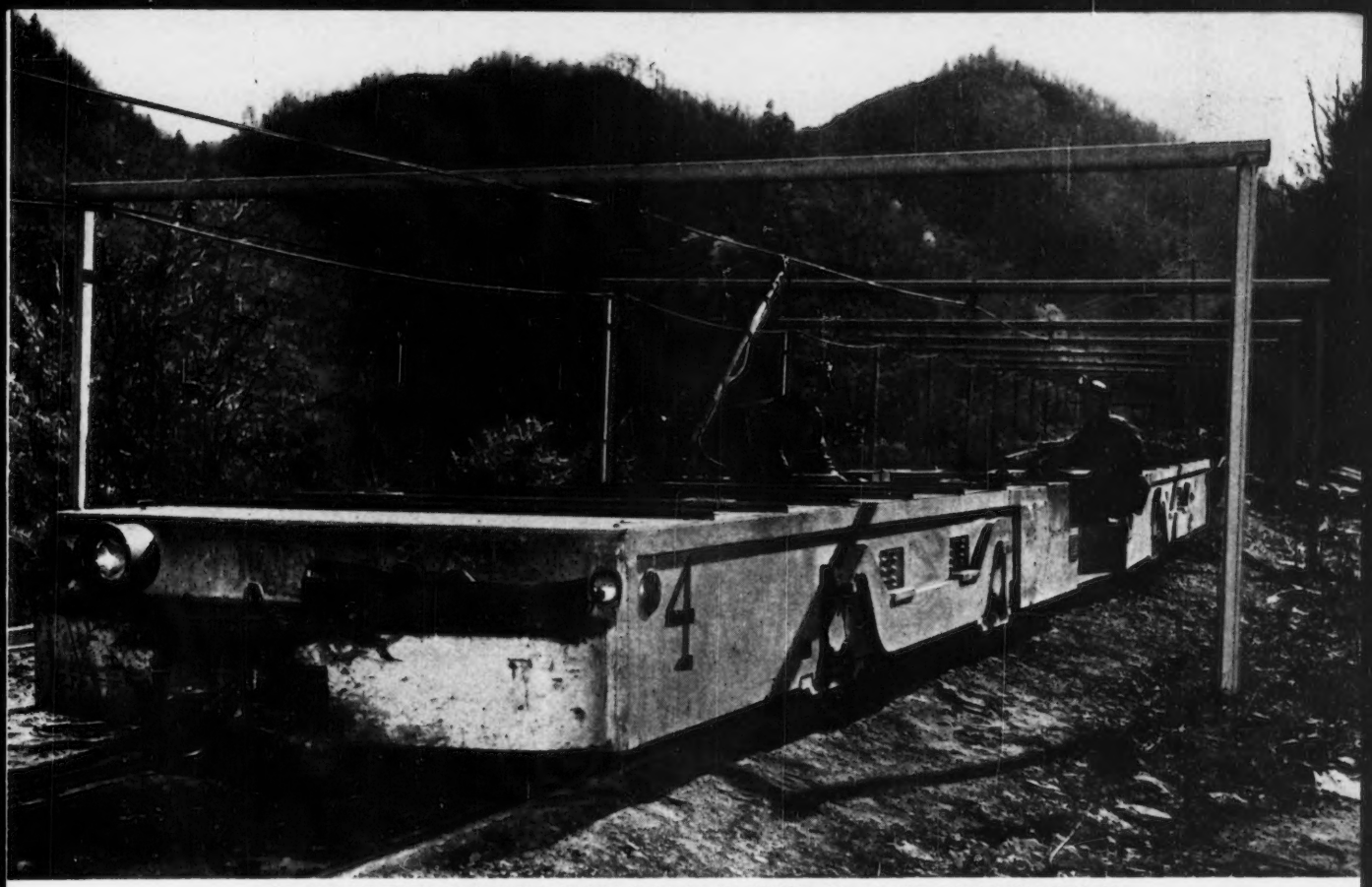
The basic E design permits maximum use of standardized parts . . . closer control over materials, processing, inspection and assembly . . . resulting in faster delivery from interchangeable stocked assemblies.




# FALK ...a good name in industry

**THE FALK CORPORATION · 3001 W. Canal St. · Milwaukee 8, Wis.**

**WRITE FOR BULLETIN 3104**



G-E 15-TON LOW-HEIGHT LOCOMOTIVES PERFORM A DEMANDING HAULAGE JOB AT POND CREEK POCOHONTAS CO.

## *ON 3% WEST VIRGINIA GRADES . . .*

# Dynamic braking on G-E locomotives gives safer operations, cuts maintenance costs

Fourteen General Electric low-height locomotives, in operation at the Pond Creek Pocohontas Co. since 1952, have helped the mine to set a production pace of 3600 tons a day. According to Alex C. Matney, mine superintendent, the 15-ton locomotives have lived up to their reputation for being fast, powerful, easy to operate and maintain.

### DEPENDABLE BRAKING AND PULLING POWER

From mine to tipple at the company's Bradshaw 6 mine is a generally downhill run, broken up by occasional rises. The mine regularly strings together as many as fifty cars with a gross weight of 6½ tons each. On a hauling job of this size, three G-E locomotives are assigned. Their dynamic braking holds downhill speed of this 370-ton load within safer limits on grades that exceed three per cent in some places. On upgrades of as much as two per cent that are encountered on the run, the dependable pulling power of G-E locomotives takes the load over with ease.

The dynamic braking action is so effective that it can slow the cars to an almost complete stop. Minimum duty is required from the brake shoes. The longer brake-shoe life that results means a considerable saving for the Pond Creek Pocohontas Co. Comparing the G-E locomotives to others with which he has had experience, Mr. Matney estimates that G-E dynamic braking saves more than 50 per cent on the cost of brake-shoe maintenance.

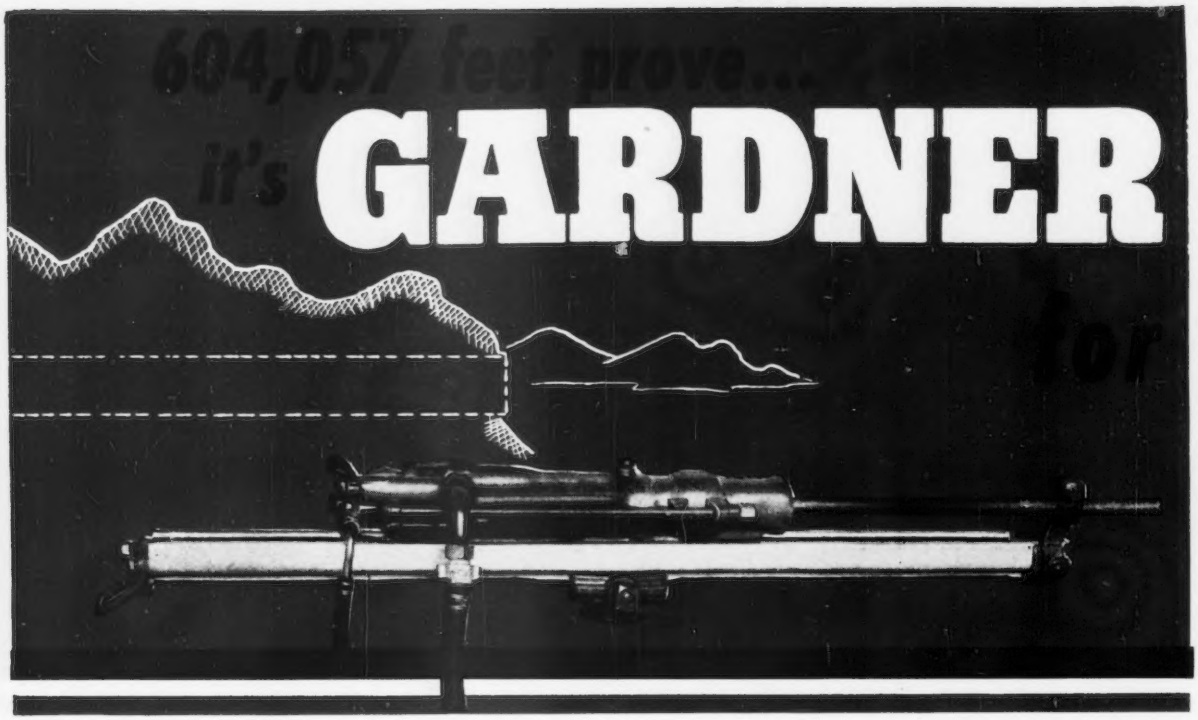
### LOW HEIGHT IS AN ADVANTAGE

A particular advantage of the locomotives in use at Bradshaw 6 is their low height. The mine has a very low roof, but the 28-inch-high locomotives can travel the rooms and haulage ways with ease and safety.

**General Electric makes trolley-type mine haulage locomotives from 4 to 50 tons in a wide range of limiting dimensions, for 250- or 500-volt systems. Ask your G-E Apparatus Sales Engineer for descriptive bulletin GEA-4676. Or, write for it to: General Electric Co., Section 120-71, Schenectady 5, N. Y.**

*Progress Is Our Most Important Product*

GENERAL ELECTRIC




| TUNNEL | LOCATION | LENGTH | BORE | DRILL EQUIPMENT GARDNER-DENVER |
|---|---|---|---|---|
| Bear River, Mokelumne Project | California | 13,520 ft. | 8½'x11' | Full |
| Bingham Tunnel #5840 | Utah | 7,000 ft. | 21'x26' | Full |
| Carter Lake Pressure | Colorado | 5,800 ft. | 10' | Full |
| Cherry Valley Dam Diversion | California | 1,280 ft. | 18½' | Full |
| Downsville Dam Diversion Tunnel | New York | 1,900 ft. | 45' | Full |
| Duchesne | Utah | 31,665 ft. | 11' | Full |
| East Delaware Aqueduct | New York | 132,860 ft. | 11'4" | Full |
| Frenchman Hills | Washington | 9,200 ft. | 16' | Full |
| Grand Valley Emergency | Colorado | 2,240 ft. | 13' | Full |
| P. G. & E. Pitt #4 Tunnel | California | 21,500 ft. | 23' | Full |
| Paraiba-Pirai Diversion | Brazil | 12,624 ft. | 25'x23' | Full |
| Rattlesnake | Colorado | 8,760 ft. | 11½' | Full |
| Rideau River | Ontario | 9,000 ft. | 7' | Full |
| Ross Dam Diversion | Washington | 2,000 ft. | 19½' and 27½' | Full |
| Sa Carvaiho | Brazil | 13,400 ft. | 17'x17' | Full |
| Tennessee Creek | North Carolina | 4,800 ft. | 13'x14' | Full |
| U of Washington Tunnel | Washington | 5,280 ft. | 6'x8' | Full |
| MDC North Relief Sewage | Massachusetts | 3¾ miles | 12' | Partial |
| Piney Branch Trunk Sewer | Washington, D. C. | 1,875 ft. | 15' | Full |
| Meilleur Atlantique | Quebec | 1,575 ft. | 11' | Full |
| | | 9,000 ft. | 10', 9' & 7' | Partial |
| Sir Adam Beck Hydro-Electric Project | Ontario | Twin 5½ mile | 52' | Partial |

# - DENVER

## tunnel-drilling!

**Here's the tunnel record . . . that speaks for itself . . .**

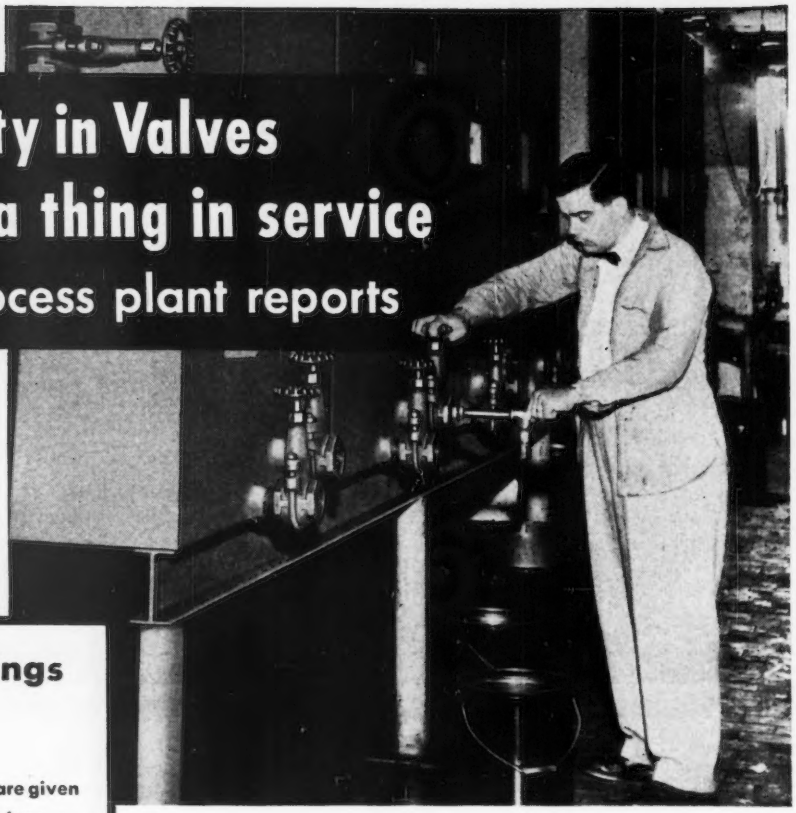
**It adds up to 604,057 feet of tunnel — and remember, this list represents ONLY those tunnels which were drilled during the last five years!**

| TUNNEL | LOCATION | LENGTH | BORE | DRILL EQUIPMENT GARDNER-DENVER |
|---|---|---|---|---|
| Hamilton Sewer Project | Ontario | 3,300 ft.<br>2,780 ft. | 12½′x12½′<br>8′x8½′ | Full<br>Partial |
| Cincinnati Water Works | Ohio | 14,000 ft. | 11′ | Full |
| Santa Cecilia-Vigario | Brazil | 12,624 ft. | 25′x23′ | Partial |
| Calumet Contract #18C | Illinois | 2,000 ft. | 7′1″x6′4¼″ | Partial |
| P.G. & E. Hendricks Tunnel | California | 4,600 ft. | 6′x7½′ | Partial |
| South Laguna Beach Sanitary Sewer | California | 12,000 ft. | 4′x6′ | Full |
| Spokane Sewer Tunnel (Section B-2) | Washington | 6,250 ft. | 6½′x7½′ | Full |
| Cobbs Creek Intercepting Sewer | Pennsylvania | 6,000 ft. | 10′6″ | Partial |
| Metlakatla Indian Community Purple Lake Project | Alaska | 2,600 ft. | 7′x7′ | Full |
| Boqueron Tunnel #1 | Venezuela | 5,900 ft. | 28.7′x19.7′ | Full |
| Boqueron Tunnel #2 | Venezuela | 1,560 ft. | 28.7′x19.7′ | Full |
| Belviso Creek Project | Italy | 16,150 ft. | 10′2″ | Full |
| Surco Tunnel Project | Peru | 20 km (12.5 miles) | 9¼′x8¼′ | Partial |
| Southwest Main Gravity Intercepting Sewer Tunnel | Pennsylvania | 18,000 ft. | 17′ to 8′6″ | Full |
| Bacon Tunnel | Washington | 10,000 ft. | 21′ horse shoe | Full |
| Detroit Dam Diversion Tunnel | Oregon | 230 ft. | 31′ horse shoe | Full |
| Detroit Dam | Oregon | 1,200 ft. | 28′ | Full |
| Lucky Peak Dam | Idaho | 1,200 ft. | 23′ | Full |
| Eugeria Hidroelectrica Andina S.A. | Peru | 7.8 miles | 9′x12′ | Partial |
| Laranjeiras | Brazil | 3,320 ft. | 20′x60′ | Full |

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS
FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

# Similarity in Valves doesn't mean a thing in service

## ...Chicago process plant reports



### The Installation

At Hysan Products Co., Chicago manufacturer of liquid waxes, pine oil and coal tar disinfectants, liquid soaps, insecticides and various chemical specialties—where Crane clamp gate valves have been installed on all process and storage piping.

### Valve Service Ratings

**SUITABILITY:** Performance-proved
**FEATURES:** Tight seating
**MAINTENANCE COST:** Only routine care given
**SERVICE LIFE:** Many times former valves—still like new
**OPERATING RESULTS:** Costly loss and trouble stopped
**AVAILABILITY:** Crane Catalog item—No. 488

### The Valve

Crane clamp gates are of rugged design, with seating surfaces machined to close tolerances. That's why they provide long-lasting, tight closure, even where operation is frequent and fluids are hard to hold. Many patterns to choose from in these compact valves—all iron or brass-trimmed. Consult your Crane Catalog or your Crane Representative.

### The Case History

Longest service given by similar type valves formerly used was from 2 to 6 months. They failed to hold tight at seats and disc under daily operation of 3 to 12 cycles. Valve maintenance and replacements were excessively costly—as were down-time losses. Leaky valves on tank lines forced repeated transfer of storage stock. Up to 3 men were needed to make valve repairs.

Only when the plant switched to Crane No. 488 clamp gate valves was the trouble stopped. Installed more than a year ago, the valves show no sign of wear or leakage. Only an occasional pull-up on the packing nut is needed—and only one man for all piping maintenance.

What's the answer? Better quality valves, obviously—the only way to assure better service and lower ultimate cost.

*THE BETTER QUALITY . . : BIGGER VALUE LINE . . . IN BRASS, IRON, STEEL*

# CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
*Branches and Wholesalers Serving All Industrial Areas*

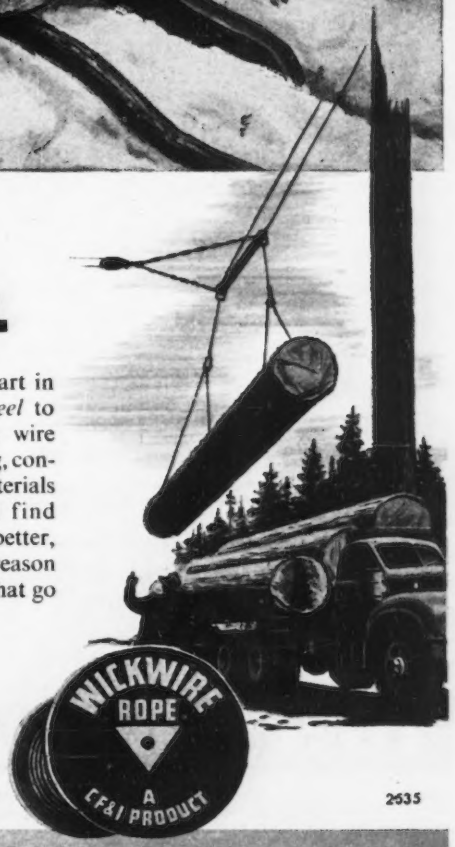
***VALVES • FITTINGS • PIPE • PLUMBING • HEATING***

## *now—the logs are lighter with* MUSCLES OF STEEL

Gone are the days when muscles of man and beast were the only means of loading and hauling big timber out of the woods. Supplying present-day lumber needs is a job that would lick ten thousand Samsons.

It's a job that demands *muscles of steel*—rugged wire rope that lifts and pulls the heaviest logs with strength to spare.

We of Wickwire play a big part in furnishing these *muscles of steel* to American industry. Wherever wire rope is used—timbering, drilling, construction, mining, fishing, materials handling—there also you'll find Wickwire Rope helping to do a better, more efficient job. That's the reason for the quality and extra care that go into its making.



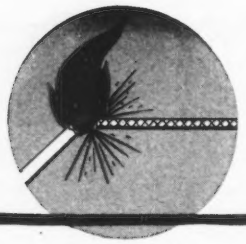

***every* industry benefits from wire rope**

**WICKWIRE ROPE**

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

2535

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia



# LIGHT IT-*and walk away!*

## Ignitacord will ignite every fuse in the round

*Less hazard* and *greater efficiency* are two reasons why the new type IGNITACORD* is gaining favor for rotation firing.

**1.** The Blaster lights the Ignitacord at one point—and leaves the face. The Ignitacord can be ignited with safety fuse to obtain a longer delay if desired.

**2.** All fuses in the round are cut to uniform length. There is no need for trimming, since accurate time delay and proper rotation is governed by the length of Ignitacord used between holes.

IGNITACORD burns progressively at a uniform speed along its length with an external flame at the zone of burning. The flame is short and hot — acts like the flame of a Hot Wire Lighter.

Two types are available. Type A burns at approximately 8 to 10 seconds per foot. Type B burns at approximately 16 to 20 seconds per foot. Each type is packed on 100-foot spools with identifying label. Both types are color-marked at one-foot intervals, making it easy for the Blaster to connect the fuses at correct intervals.

IGNITACORD CONNECTORS provide the most efficient and convenient method of attaching Ignitacord to Safety Fuse. The Connector is a metal shell containing an ignition charge. The shell is slipped over the freshly cut end of the fuse and crimped. A slot near the opposite end receives the Ignitacord, which is held firmly in place when the top is pressed down against it. Ignitacord Connectors are supplied in packages of 100.

*Sold on the West Coast under the name of SPITTERCORD by the Coast Manufacturing and Supply Co., Livermore, California.

*See your Explosives Supplier or write to*

**THE ENSIGN-BICKFORD COMPANY**

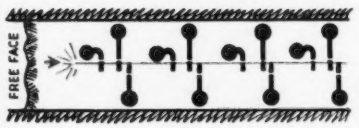
**SIMSBURY, CONNECTICUT**

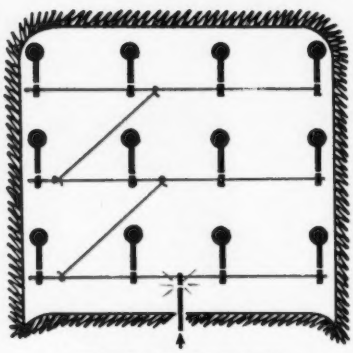
*Manufacturers of PRIMACORD® Detonating Fuse — and Safety Fuse since 1836*

IG-1

**IGNITACORD®**

**and CONNECTORS**

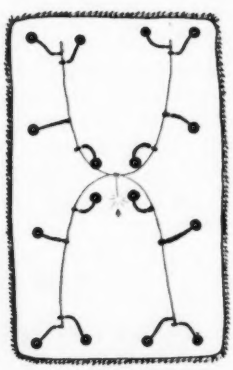


**FIRING STOPE ROUNDS**

*Fig. 1* shows a stope drilled with three rows of uppers, the fuse from each hole being connected to a single line of Ignitacord. Note that the center holes will fire before the two corresponding rib holes.

In *Fig. 2* the fuses extending from the horizontal breast holes are connected to four lines of Ignitacord at regularly spaced intervals. Jumper lines connect the horizontal lines, and the Igniter cord is activated by a length of Safety Fuse at Point A.

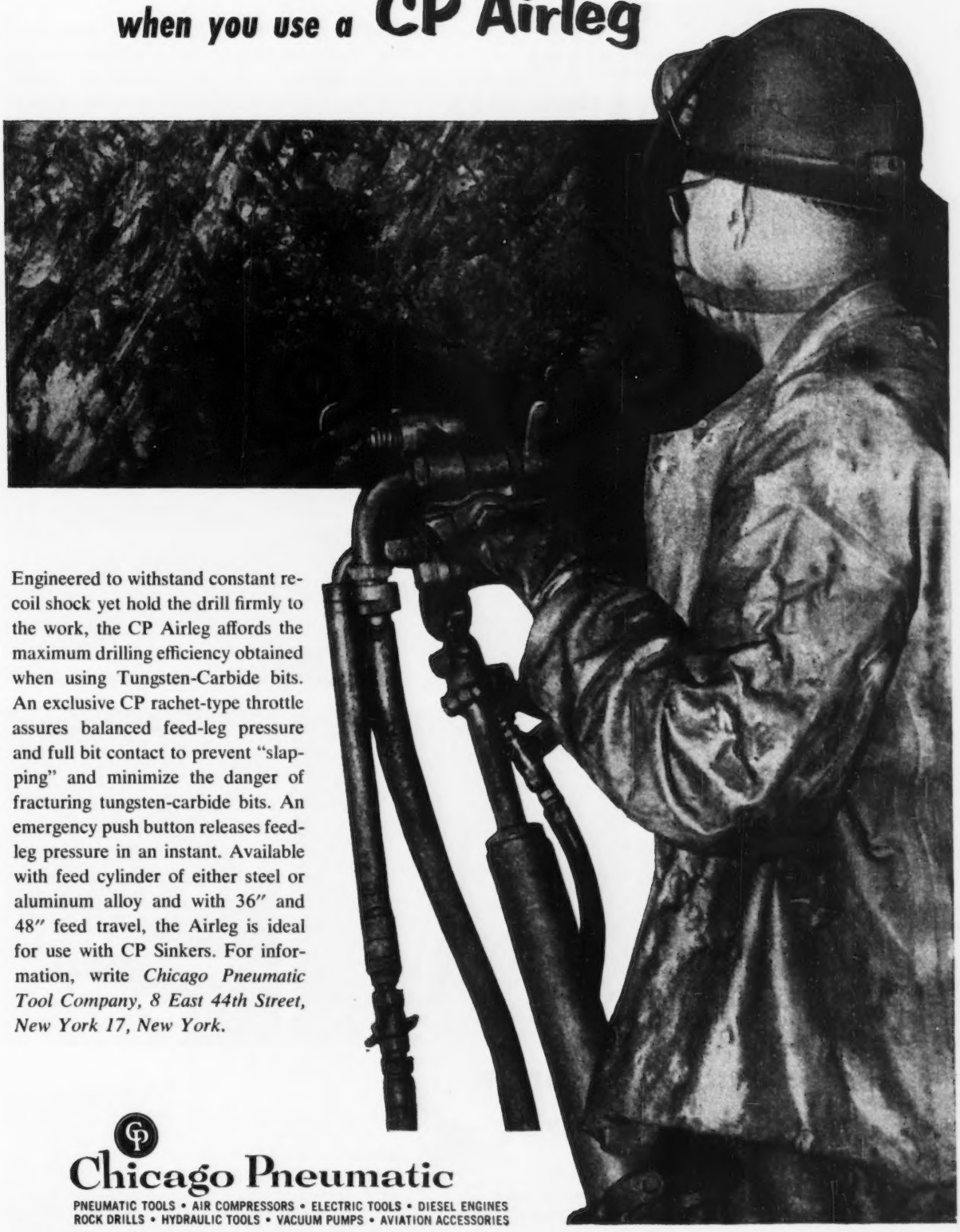


**FIRING DEVELOPMENT ROUNDS**

*Fig. 3* illustrates an Ignitacord hook-up arranged to fire the cut holes in one group, and the remaining holes in the proper order of rotation. Ignitacord lines should always be kept separated enough to avoid cross ignition.

# You've Really Got a Leg to Stand On

## when you use a CP Airleg



Engineered to withstand constant recoil shock yet hold the drill firmly to the work, the CP Airleg affords the maximum drilling efficiency obtained when using Tungsten-Carbide bits. An exclusive CP rachet-type throttle assures balanced feed-leg pressure and full bit contact to prevent "slapping" and minimize the danger of fracturing tungsten-carbide bits. An emergency push button releases feed-leg pressure in an instant. Available with feed cylinder of either steel or aluminum alloy and with 36″ and 48″ feed travel, the Airleg is ideal for use with CP Sinkers. For information, write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

**Chicago Pneumatic**

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

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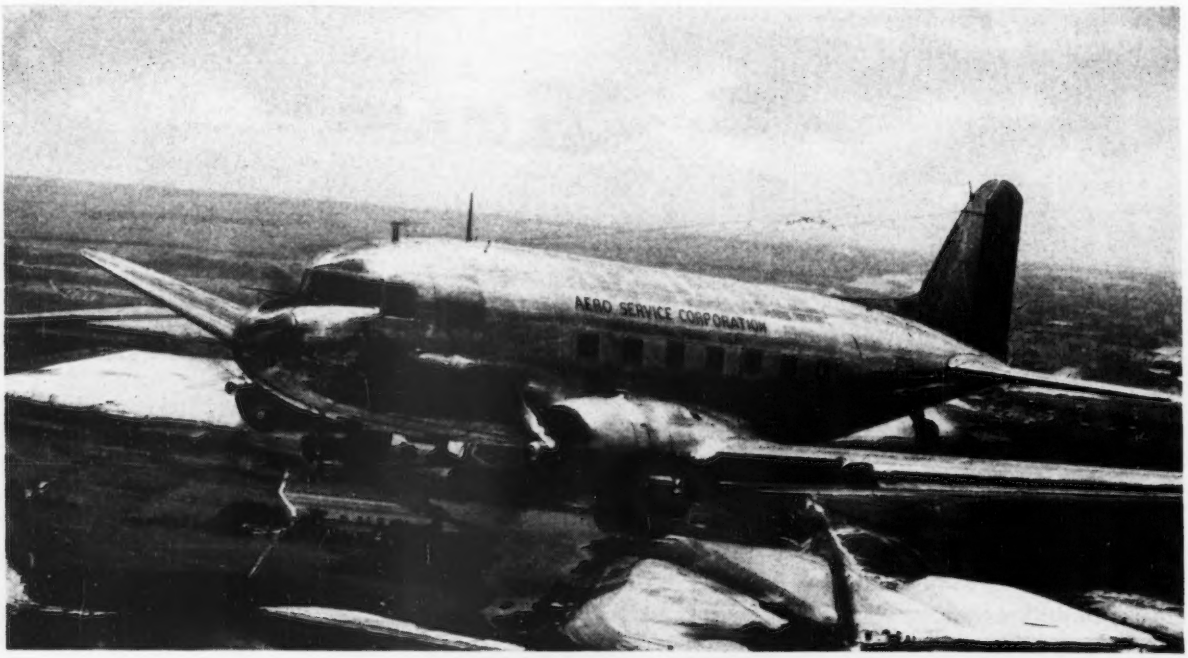
## CORPORATION
## LEADER IN AERIAL MAPPING

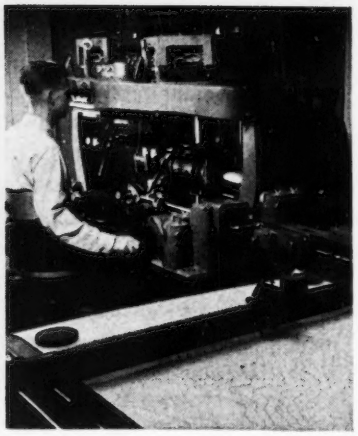
Whether you're exploring for minerals, or whether you need maps to aid engineering development, aerial surveys are today's fastest and most economical means of bringing information to the desk of engineers and geologists.

AERO—oldest flying corporation, and leader in aerial mapping—is best equipped to serve you—swiftly and dependably—no matter where. Let us show you how AERO mapping can serve you.




(*Right*) With the sensitive Gulf airborne magnetometer, AERO crews are uncovering important deposits of iron, chrome, nickel, asbestos, titanium and other important minerals.

(*Extreme right*) Skilled AERO mappers, with complex instruments like this A-7 Stereoplotter, produce topographic maps of engineering accuracy for planning roads, rail spurs, harbor facilities and other developments.



**AERO SERVICE CORPORATION**

*Philadelphia 20, Pennsylvania*

*Oldest Flying Corporation in the World*

AIRBORNE MAGNETOMETER SURVEYS
PRECISE AERIAL MOSAICS • TOPOGRAPHIC MAPS
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*Affiliates:*
AERO SERVICE CORPORATION (*Mid-Continent*), TULSA
AERO SERVICE CORPORATION (*Western*), SALT LAKE CITY
CANADIAN AERO SERVICE, LTD., OTTAWA

# *Draw to these three...*

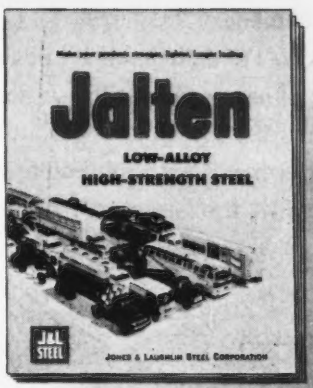
## THEY'RE ALL JALTEN!

J&L's New JALTEN series enables you to select low-alloy, high-strength steel in the following combinations of advantages:

**JALTEN No. 1** — High strength, good formability and fabricating —good resistance to low temperature impact.

**JALTEN No. 2** — High strength, moderate forming—improved resistance to atmospheric corrosion.

**JALTEN No. 3** — High strength—improved resistance to abrasion.




**The data you want is in this book:**

- Chemical Properties of Jalten
- Mechanical Properties of Jalten
- Jalten Equivalents
- Jalten Application Data

**Remember to specify JALTEN High Tensile Steel for**

- HIGH STRENGTH • RESISTANCE TO CORROSION
- GOOD FORMABILITY • RESISTANCE TO ABRASION

J&L STEEL

*Jones & Laughlin*
STEEL CORPORATION — *Pittsburgh*

Jones & Laughlin Steel Corporation
Dept. 412, 3 Gateway Center, Pittsburgh 30, Pa.

Please forward a copy of your booklet, Jalten low-alloy, high-strength steel.

Name_____

Company_____

Address_____

## TEAMED FOR DRILLING EFFICIENCY....

**Crucible CA Double Diamond Alloy Hollow Drill Rods**

**Crucible HY-Tuf for tungsten carbide bit bodies**

Here's a combination you just can't beat . . . detachable bits of Crucible HY-Tuf® alloy steel with tungsten carbide inserts and Crucible CA Double Diamond® Alloy Hollow Drill Rods . . . the toughest, longest-lasting drill steel made.

HY-Tuf detachable bit bodies are made to withstand the terrific pounding of heavy rock drills . . . pounding which no ordinary steel can possibly take. And Crucible CA Double Diamond Rods give you superior drilling performance with minimum rod breakage and bit losses . . . a *team* that provides the *lowest cost per foot of hole drilled.*

54 years of Fine steelmaking

**CRUCIBLE** first name in special purpose steels

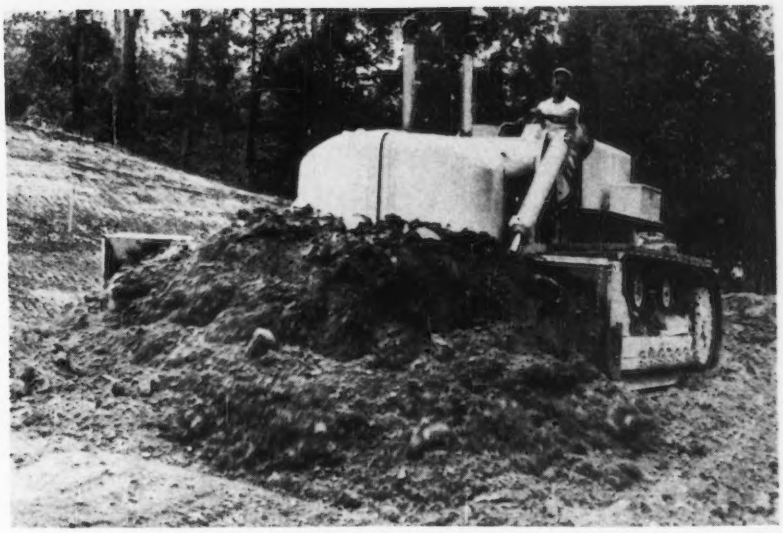
**HOLLOW DRILL ROD**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

**PREVIEW**



**Euclid Twin Crawler** shoves earth around at GM Proving Ground, Milford, Mich.

# Euclid Develops 380-hp Crawler Tractor

DUE OFF the Euclid Division (General Motors) production line within the next seven months is the TC-12 Twin Crawler tractor, which promises twice the hp of tractors now in production, twice the drawbar pull at 2½ mph scraper loading speeds, faster, more flexible steering, easier maintenance and greater economy per yd of earth moved.

Euclid TC-12 is powered by two 190-hp GM Diesel 6-cylinder engines, each driving an Allison torque converter and Allison Torqmatic transmission, and mounted on separate drive and track assemblies.

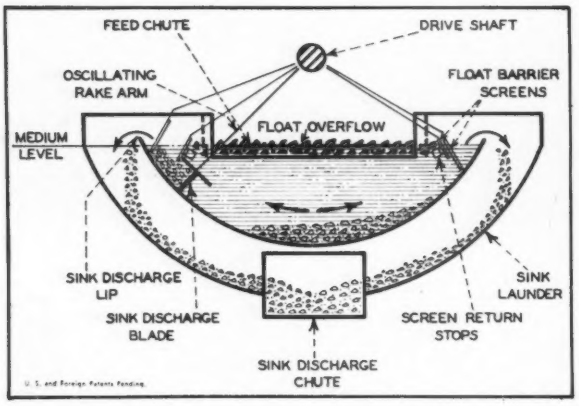
The two sections oscillate on a 7-in. transverse shaft and give greater traction because each half of the tractor maintains ground contact over uneven ground. Free movement of seven inches is limited by stops welded to each frame half. Top forward speed is 8 mph.

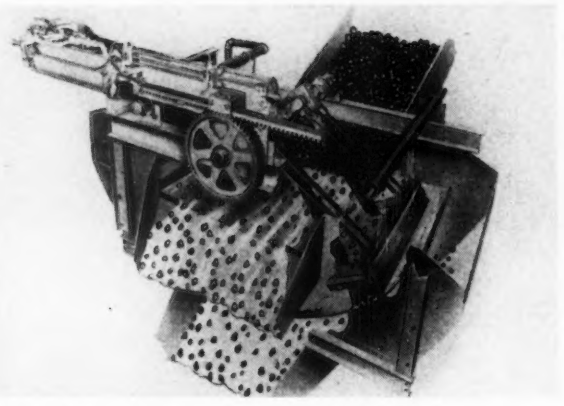
The two transmissions provide three speeds forward and three reverse. There is no master clutch. TC12 can be shifted without loss of motion and can be shifted into reverse while still going torward. Steering may be by increasing or decreasing speed of one engine for gradual change in direction; by application of track brake while one engine is in neutral; or by putting one engine in forward and the other in reverse. Latter can give "ship" turns on a dime.

Tractor can be dismantled and assembled with ordinary serviceman's tools. Parts are accessible, easily maintained.

Other vital statistics: weight—53,000 lb; length—15 ft; width—11 ft 4 in.; height, exclusive of exhaust stacks, 8 ft; ground pressure—8½ psi. There are 39 shoes on each side, each shoe 26 in. wide; length of tracks on ground is 115⅝ in.; area of ground contact with shoes is 6,000 sq in.

A full complement of attachments is slated for the exciting new TC-12, including push plate for scraper loading, hydraulically controlled 13½-ft bulldozer blade, 17-ft 3-in. angledozer blade and pull yoke for the Euclid loader.



**Reciprocating rake** removes sink from new HMS vessel. No rotating parts lie in the abrasive pulp.

# New HMS Vessel Keeps Separation Simple

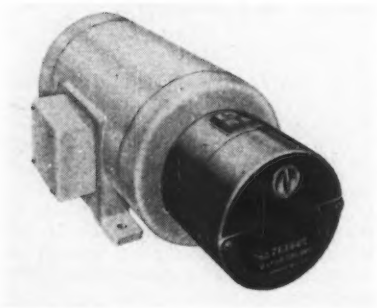
MAINTAINING that any HMS separatory vessel should be a simple mechanism whose chief function is the removal of sink economically and efficiently with a minimum of disturbance to the separating process, Ore & Chemical Corp., New York, N. Y., is now marketing a vessel which they feel meets these requirements.

As the illustrations above show, sink is removed by an oscillating rake arm and the only friction in the vessel occurs between the rubber parts of the blade and the bottom of the vessel. This wearing effect is very slight and replacement cost of the rubber parts is low. No rotating parts are in the abrasive pulp.

The drive is furnished by a hydraulic cylinder actuated by a closed oil pressure system or by compressed air. Motion is smooth and the number of strokes per minute can be varied in a few seconds. The pool of the OCC vessel is very quiet with a practically undisturbed surface. Density is maintained throughout because the reciprocating motion of the blade prevents eddy currents and unwanted turbulence and settling out of the medium.

Power requirements are said to be low since the only moving part is the blade and the only power required is for lifting the actual weight of the sink to be removed from the pool. Since the vessel is self-draining, it is easily started as no caked medium has to be broken loose.

OCC has developed six basic designs in capacities up to 400 tph and offers full services for installation of prefabricated or tailor-made units. **(1)**



## DISC BRAKE

Stearns Magnetic, Inc., Milwaukee, Wisc., has developed the H-70 magnetic disc brake for use on re-rated 3 to 20-hp motors. It is available with maximum torque ratings of from 10 to 105 lb-ft and is designed to mount on new frame sizes 213 through 286. Features are shorter length, manual release-automatic reset wear indicator. **(2)**

## RUST REMOVAL

Non-acid rust removing material that simultaneously strips paints, rust and primer from ferrous metal surfaces has been developed by Turco Products, Inc., Los Angeles, Calif. Called Rustgon, the liquid alkaline material requires only two simple steps—a dip and a pressure rinse. **(3)**

## WELDING METHOD

"Selfweld" is a new method of welding which is fool-proof and usable by everyone according to Lincoln Electric Co., Cleveland, Ohio. Lincoln has also developed a special welding machine for use with "Selfweld." Complete with special holder and electrodes, it costs less than $100. Development makes welding for the amateur as easy as turning on a light switch. **(4)**

## ELECTRICAL TAPE

Five outstanding benefits are claimed for "Bull Dog" plastic electrical tape by its manufacturer, Boston Woven Hose & Rubber Co., Cambridge, Mass. (1) High dielectric strength of 7,000 v, averaging 1,000 v per mil of thickness by ASTM test method; (2) Highly resistant to weather, chemicals, water, oils and abrasion; (3) Excellent adhesion qualities; (4) BWH tape is extra thin to take up minimum space; (5) Has high tensile strength, yet tears easily. **(5)**

## ELECTRIC MOTOR

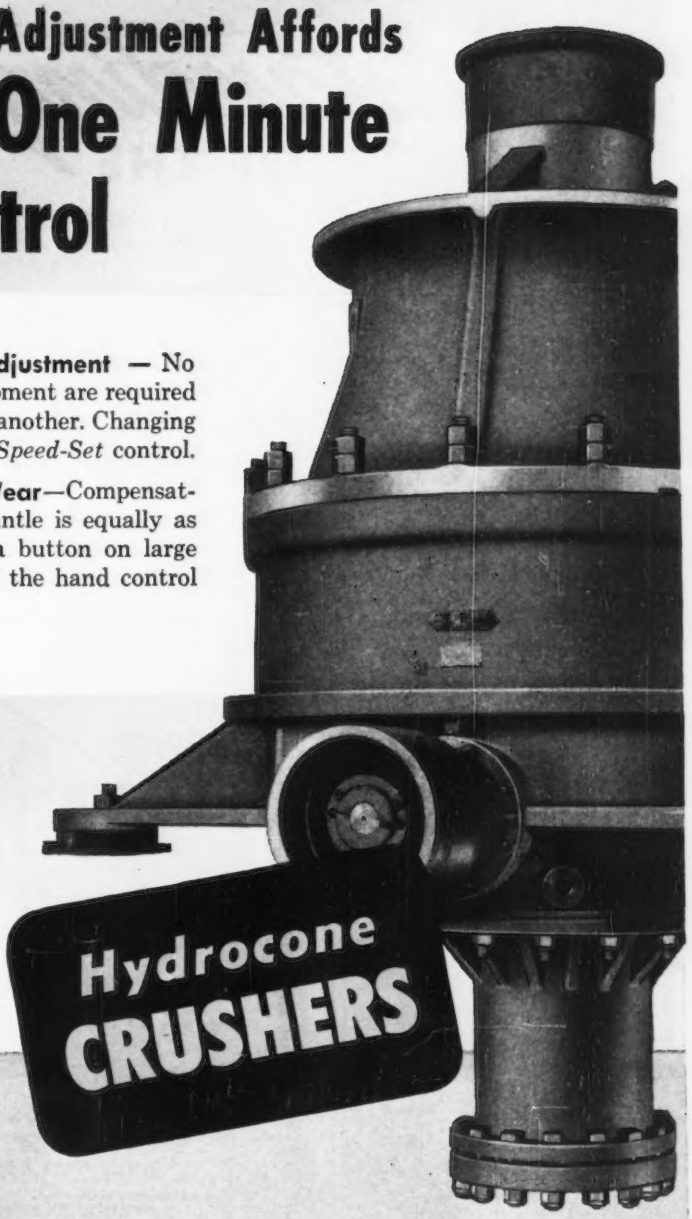
Short overall length is one of the features of the new integral Brakemotor recently announced by the Louis Allis Co., Milwaukee, Wis. Shorter length is made possible by utilizing the motor

## Speed-Set Hydraulic Adjustment Affords

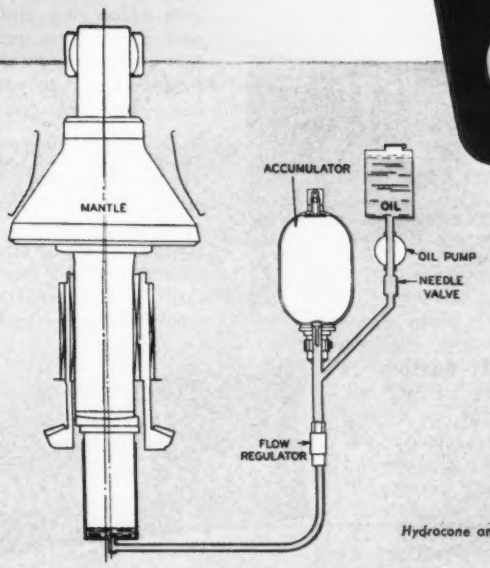
# One Man...One Minute Product Control

**Quick, Accurate Product Size Adjustment** — No dismantling and no auxiliary equipment are required to change from one product size to another. Changing is instantaneous and precise with *Speed-Set* control.

**Simplified Compensation for Wear**—Compensating for wear on concaves and mantle is equally as fast and convenient. A push of a button on large *Hydrocone* crushers or a move of the hand control on smaller sizes does the job.




**Fast Emergency Unloading and Tramp Iron Protection** — If crusher stops abruptly because of power failure or other emergency, *Speed-Set* control facilitates fast clearing of crushing chamber.




### How *Speed-Set* Control Works

Mainshaft assembly is supported on hydraulic jack. Oil pumped into or out of jack raises or lowers crushing mantle.

When tramp iron enters crushing chamber, oil from jack is forced into accumulator, allowing mantle to lower. Automatic reset returns cone to original setting after tramp material is passed.

For complete information, see your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 07B7145B.

A-4478

*Hydrocone* and *Speed-Set* are Allis-Chalmers trademarks.

# ALLIS-CHALMERS

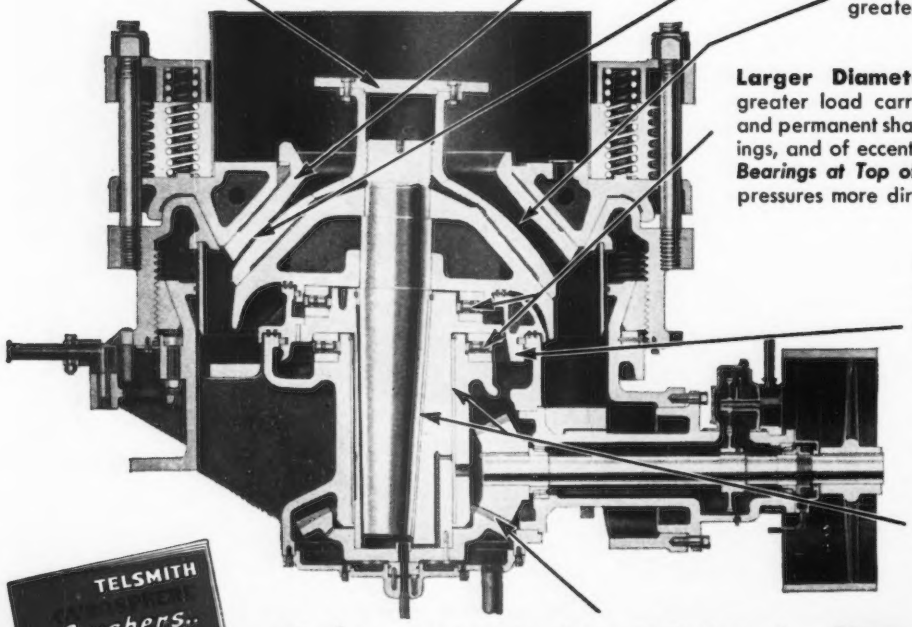
# *Outstanding* FEATURES OF THE TELSMITH *Gyrasphere*®

**Feed Distributor** gives an even distribution of the feed around the entire feed opening, resulting in a more uniform crushed product.

**Gun-Lock for Holding Concave Ring** — Automatic self-tightening, requires no bolts, and is easier to change.

**Longer Parallel Crushing Zone** gives a finer, more uniform product with a larger percentage down to size.

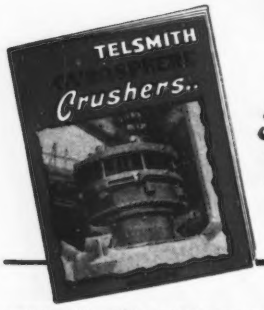
**Longer Crushing Stroke** gives greater capacity and less packing.



**Larger Diameter Roller Bearings** with greater load carrying capacity. Give perfect and permanent shaft alignment in eccentric bearings, and of eccentric in main frame. ***Both Roller Bearings at Top of Eccentric*** carry all crushing pressures more directly into heavy main frame.

**Patented Rotary Seal** with piston ring and labyrinth seals, gives most perfect protection against entrance of dust or water, or loss of lubricant.

**Higher Eccentric Bearings** give more bearing area in the upper zone of greatest crushing pressures, assuring more permanent shaft and eccentric alignment and longer bearing life.




*Send for Bulletin No. 274*

**Main Drive Gear At Bottom of Eccentric** assures more perfect and permanent alignment of gear and pinion, giving smoother running and longer life for both gear and pinion and less strain on countershaft bearings.

Y-12

STYLE FC
FINE CRUSHING

**SMITH ENGINEERING WORKS, 502 E. CAPITOL DRIVE, MILWAUKEE 1, WISCONSIN**

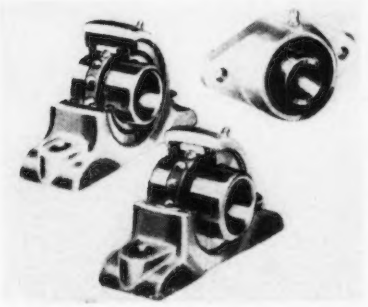
Cable Address: Sengworks, Milwaukee

Samuel Osborn (S. A.) Ltd., Johannesburg, So. Africa • 51 East 42nd St., New York 17, N. Y. • 100 W. Monroe St., Chicago 3, Ill.

W. B. Thompson Co., Iron Mountain, Mich. — Berry, Inc., Duluth 2, Minn. — Mine & Smelter Supply Co., Denver 17, Colo. — Fowler Eqpt. Co., Salt Lake City 8, Utah — Mines Eng. & Eqpt. Co., San Francisco 4, Calif.

Robert S. Bailey, Los Angeles 17, Calif. • Ontario Eqpt. & Supply Ltd., Toronto, Canada • Gordon Russell, Ltd., Vancouver, B. C.

end bracket as an integral part of the brake. According to the company, this permits the use of Brakemotors in applications formerly prohibited by space limitations (6)

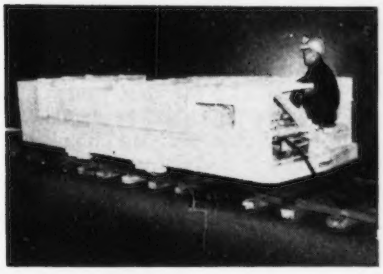


### PILLOW BLOCK MOUNTINGS

New improvements in the light duty ED series of regular and rubber insulated ball bearing pillow block and flange mountings have been announced by the Ahlberg Bearing Co., Chicago, Ill. All are now equipped with double set screws for more permanent shaft locking and have standard gun type lubricant fitting instead of the ball check oil fitting formerly used. (7)

### DIESEL STARTERS

A modified method of starting diesel tractors in underground mining operations, where gasoline starting engines may not be applicable, is being employed by Caterpillar Tractor Co., Peoria, Ill. Already in use on three DW10 tractors hauling lead ore in National Lead mines, the system consists of a Morrison air starter modified to an electrical system. On most models of Caterpillar track-type or wheel tractors, an electric starting system or air starting is possible. (8)



### COMPRESSOR

Unique six-stage compressor is powered with a 50 hp motor. It is available in two models—semi-portable (non-self tramming) and full-portable (self tramming). Each has a choice of mounting—rail wheels for track mining or rubber-tired wheels for trackless mining. These portables weigh 16,000 lb and 20,000 lb respectively, stand as low as 35 in. in height, are 63 in. to 76 in. in width and less than 14½ ft in length. Maximum pressures of 12,000 psi are obtained. Olin Industries, Inc., East Alton, Ill. (9)

### SEECLOTH

Chemically treated cloth "Seecloth," for simultaneously cleaning and mistproofing goggles, glasses, masks, windows, mirrors and windshields has been developed by Hygiene Research, Inc., Los Angeles, Calif. Merely wiping glass or transparent plastic with the Seecloth is sufficient not only to clean but also to mistproof it for a period of a few hours to two weeks, depending on atmospheric conditions. The cloth can be used over and over and with care remains effective for six months or more. (10)

### PORTABLE DRILL RIGS

Designed for fast Seismograph shot hole, blast hole or core drilling with only minor adjustments required for each operation, these portable rigs come in two sizes and have been designated AR-1250 and AR-2000 by Drilling Accessory Mfg. Co., Dallas, Tex. Important features are DAMCO's standardization of air clutches and use of hydraulic torque converter coupling and auxiliary transmission on the mud pump. (11)

### GASOLINE MINE HOIST

Vulcan Iron Works Co., Denver, Colo. has designed a gasoline mine hoist for shaft or slope service at properties remote from electric power. It incorporates safety features not usually found with gasoline equipment. Lowering and hoisting are both performed in gear. The two sets of heavy duty post brakes meet the requirements of rigid state mining laws. Specifications are as follows:

| | |
|---|---|
| Rope pull | 5,000 lb |
| Rope speed | 275 fpm |
| Engine hp | 90 hp |
| Weight | 6,000 lb |
| Overall dimensions | 7 ft 3 in. x 8 ft x 5 ft 1 in. high |
| Drum | 1,000 ft of ⅝ in. or 850 ft of ¾ in. |

The hoist is mounted on an unbreakable


An Ideal WILD "WORKING TEAM" for Any Angle from Every Angle...

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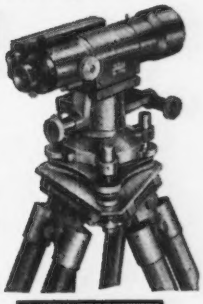

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Engineers on important developments throughout the world depend on these inherently accurate WILD surveying instruments . . . Swiss precision designed for stability under adverse conditions, for sturdiness and for ease in operation . . . they provide lasting trouble-free service.

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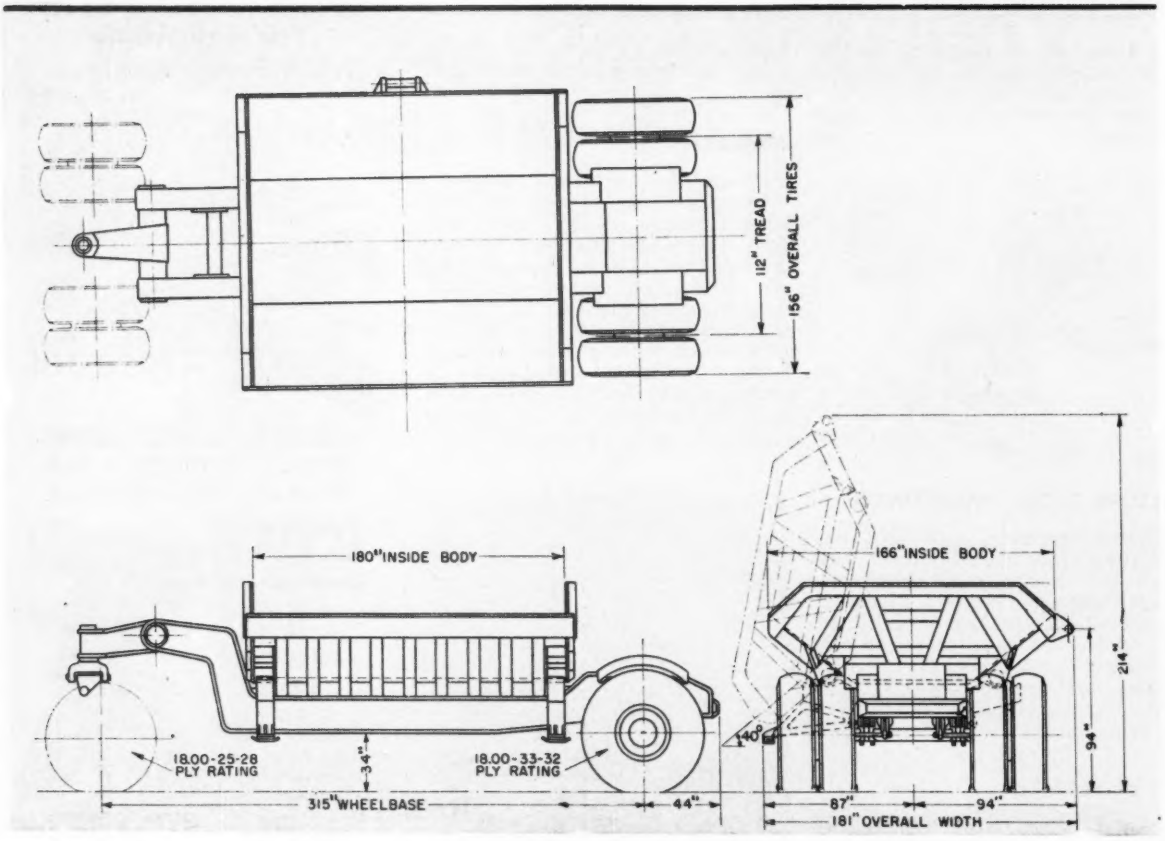



# Now—A 50-ton Side-Dump Trailer

LARGEST EVER is the pan-type side-dump trailer of 27-cu yd capacity developed by Easton Car & Construction Co., Easton, Pa. It's capable of handling 50-ton loads of iron ore, or other material weighing around 3600 lb per cu yd and presents a tandem potential of 100 tons carrying capacity—depending, of course, upon the economical need for such tonnage and the availability of a practical prime mover to handle it. The single 50-ton trailer is designed to operate with tractors now available.

Fully 15 ft long and almost 14 ft wide, the body of the new Easton 50-ton trailer presents an easy target for large, modern shovels. To absorb the bruising shock of heavy shovel loading the floor of the body is of the standard Easton sandwich type, with an oak cushion and a replaceable, heat-treated alloy lined plate.

To provide greater stability for the heavy load, Model TP-2750 has been designed with a low-slung frame and body. Tires may be either dual or single.

The new 50-ton trailers will be equipped with standard Easton E-85 axles, including springs and air brakes.

Vitally important features of any operation using pan-type trailers or bodies is the design of the hoist used for fixed-point dumping. The big new trailer will be dumped by the Easton remote-controlled electric overhead dumping system. Easton engineers consider it essential to regard the hoist as an integral part of any pan-type trailer. **(12)**

steel frame with steel skids attached. All shafts are roller bearing mounted. Arrangement of power unit with hoist results in a very compact construction. Forward and reverse speeds are secured through totally enclosed friction clutches of liberal capacity. **(13)**

## AIR HOSE

Light-weight small diameter plastic air hose for use with pneumatic tools has been announced by the Boston Woven Hose and Rubber Co., Cambridge, Mass. It is flame- and abrasion-resistant. Besides the ¼ in. inside diameter size with ⅛ in. wall, Bostrene plastic air hose is available in ⅜ in. inside diameter and 3/16 in. wall thickness at working pressures up to 120 psi at 75 deg F. **(14)**

## SPEED REDUCERS

New line of Sterling Multi-Mount Reducers simplifies application to all machinery or equipment combinations. Each type of Multi-Mount Reducer can be mounted, without modification, on floor, wall or ceiling, with shaft horizontal or vertical. Offset shafts make possible more compact designs, permit use of larger gear diameters and require fewer parts. The drive shaft with widely spaced bearings is located close to the mounting feet and therefore minimizes torsional stress on the mounting base. Sterling Electric Motors, Inc., Los Angeles, Calif. **(15)**

# The Engineer's Report

CASE HISTORY

PRODUCT *Chevron Starting Fluid*

FIRM *San Francisco Chemical Co, Montpelier, Idaho.*

# Fast starts save 50 man-hours each day!

WITH TEMPERATURES DOWN TO 20 BELOW ZERO for weeks, Chevron Starting Fluid speeds up starts of trucks, tractors and shovels at San Francisco Chemical Co.'s phosphate mine at Leefe, Wyoming. Winter temperatures here sometimes drop to 50 below zero, but even then Chevron Starting Fluid makes it possible to start both diesels and gasoline engines. According to Mr. P. S. Pugmire, General Superintendent, this occasionally saves the mine up to 50 man-hours a day — about 2 hours starting time for drivers of trucks and tractors, also time of other workmen who cannot begin work until equipment is operating. Chevron Starting Fluid is available in 1-pint cans and in 7- and 17-cc gelatin capsules. Your supplier also has the new Chevron Pressure Primer System using safe 9.9-cc pressurized steel bulbs which, when punctured, force priming fuel into air intake system, permitting instant ignition.

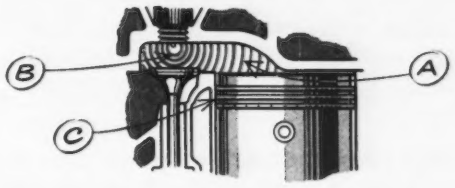
FREE FOLDERS tell you more about Chevron Starting Fluid and the Chevron Pressure Primer System Write or ask for them today.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your distributor, write or call any of the companies listed below.

CHEVRON STARTING FLUID

TRADEMARK "CHEVRON" REG. U. S. PAT. OFF

## How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly




A. Atomizes in lowest temperatures and provides easily ignited vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—inhibits cylinder wear and ice formation in primer equipment.

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# Another BIG OUTPUT Walking Dragline

*Here's big news for men engaged in strip mining or heavy-duty construction work — Bucyrus-Erie has added another big-yardage, all-weather dragline to its world-famed "walker" line. You'll find unequalled money-making features in the new 400-W . . . here are some of them.*

**THREE POWER COMBINATIONS** — Your choice of heavy-duty diesel engine, electric power with independent motor-driven drums, and electric power with clutch-operated drums.

**EFFICIENT FRONT END** — All-welded boom has T-section chord members with tubular bracing for maximum strength, minimum deadweight. Fast filling, clean carrying, quick dumping buckets help assure big output.

**LONG WORKING RANGE** — Without throwing bucket, material can be moved 405 feet with the 400-W's 200-ft. boom and 7-yd. bucket, 377 feet with the 185-ft. boom and 8-yd. bucket, and 351 feet with the 170-ft. boom and 9-yd. bucket. Digging depths range up to 135 feet.

**RAPID OPERATING CYCLE** — Fast hoisting and lowering with powerful air-controlled clutches and brakes . . . rapid acceleration and deceleration of the swing under variable-voltage Ward Leonard control.

**EXCEPTIONAL MANEUVERING ABILITY** — With exclusive Bucyrus-Erie walking mechanism, the 400-W walks where you want it, when you want it, in good weather or bad, even on ground that's too soft for other machines.

**STRONG RIGID BASE** — Provides 748 sq. ft. of bearing area for full stability in working and walking.

**STURDY MAIN MACHINERY** — Is simple in design . . . is arranged for accessibility in servicing and maintenance, and for maximum counterbalancing effect . . . is rigidly held in accurate alignment on deep-section revolving frame.

*Complete information is yours for the asking — write today!*

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**South Milwaukee, Wisconsin**

# For Your Files

**This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.**

**SKIP HOIST.** 16-page catalog shows sequence views of operation of weigh type and plug feed loading gates. Lists capacities of various size buckets, traveling varous lifts at various speeds. Describes hoist engines, sheaves, head frames, counterweights, etc., it is profusely illustrated to show adaptation to handling a wide variety of different materials. C. O. Bartlett & Snow Co., Cleveland, Ohio. **(71)**

**DIESEL MAINTENANCE.** A series of three engineering data sheets for those concerned with diesel engine maintenance, is available from Wall Colmonoy Corp., Detroit, Mich. Sheets give information on application of Colmonoy nickel-base and iron-base hard-facing and spraywelding alloys to diesel engine valves to provide wear surfaces that resist abrasion, impact, galling and corrosion. **(72)**

**WELDING TORCHES.** A 36-page catalog (ADC 702B) covers the complete line of torches and tips for oxyacetylene cutting and welding, made by Air Reduction Sales Company, New York, N. Y. **(73)**

**VALVE.** Cushioned Flowtrol Valve is fully described in a new technical bulletin published by Golden-Anderson Valve Specialty Co., Pittsburgh, 6, Pa. One man can easily operate the valve whether size is 2 in. or 36 in. or pressure is 15 psi or 400 psi. **(74)**

**RUBBER PRODUCTS.** Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J. has a new catalog which covers V-belts, transmission belts, conveyor belts, all types of hose, molded products and outlines such new R/M products as Poly-V Drive which combines simplicity of flat belts and grip of V-belts, R/M Super-Power V-Belts, the "XDC" Conveyor Belt Cover, and the Hydro-Lok Rubber Pipe Flange. **(75)**

**CONTROL VALVES.** Design details and operating characteristics of its complete line of needle type valves are explained by Foxboro Co., Foxboro, Mass. in an 8-page bulletin, 5C-13. **(76)**

**VENTILATION.** Industrial installations of Flexaust hose and of Portovent duct for moving air, dust, fumes, gases, and materials efficiently and at lower cost are described in Bulletin No. 40 published by the Flexaust Co., New York **(77)**

**NYLON BEARINGS.** Eight-page illustrated catalog has just been published fully describing the standard lines of Nylined Bearings and Nyliners, manufactured by Thomson Industries, Inc., Manhasset, N.Y. The advantages of Nylon as a bearing material, particularly where bearings must operate without oil lubrication, are explained. In addition, the catalog contains engineering data, installation information, and a bearing evaluation chart. **(78)**

**ELECTRIC SHOVEL.** An 8-page, two color Bulletin X-162 introduces P&H Model 1055-E, similar in size to the standard 3½-yd P&H Model 1055, but completely electric, driven by constant-speed ac motors throughout. Power transfer is through frictionless P&H Magnetorque units for all shovel motions —swing, hoist, crowd, and propel. Harnischfeger Corp., Milwaukee, Wis. **(79)**

**V-BELTS.** V-Belt drive manual contains selection tables, all data required to design a V-drive with new improved horsepower ratings, sheaves and pulleys. T. B. Wood's Sons Co. **(80)**

**PRODUCTIVE MAINTENANCE.** "Five Steps to Productive Maintenance" is an 18-page bulletin (GEA-6087) providing detailed information on organizing to meet the demands that automation will make on your electrical maintenance program. Steps discussed include (1) gathering equipment data; (2) determining extent of routine maintenance; (3) establishing an operating control system; (4) evaluation for critical maintenance; and (5) establishing a critical maintenance program. General Electric Co., Schenectady, N. Y. **(81)**

**BLAST HOLE DRILL.** This 24-page bulletin (50-T-2) describing the 50-T blast hole drill manufactured by Bucyrus-Erie Co., So. Milwaukee, Wis., offers a complete description of the machine's features along with a general specifications list. The 46-ft derrick can handle tool strings up to 6,000 lb, and drill 9 to 12-in. diameter holes. **(82)**

**V-BELTS.** "Engineering Data for Multiple V-belts," available from Goodyear Tire and Rubber Co., Inc., Akron, Ohio, should be in your files. From the theoretical considerations of V-belt design, covered by formula and drawings, to the practical problem of selecting the belt for your job, this 32-page booklet gives thorough coverage. **(83)**

**BLAST HOLE DRILL.** "Only machine of its kind developed as a dual purpose blast hole drill for either rotary or percussion drilling," is what the manufacturer, Ingersoll-Rand, New York, N. Y., claims for the QM-2 Quarrymaster. In Bulletin 4135, the features and uses of the QM-2 as a percussion drill are described, followed by two pages describing it as a rotary drill. **(84)**

**ROOF SUPPORT.** "Bethlehem Yieldable Arch for Mine Roof Control," a new folder describing yieldable steel mine roof supports, has just been released by Bethlehem Pacific. The yielding arch differs from conventionally rigid types in that it yields rather than deforms

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under excessive pressures, thus allowing the surrounding strata to stabilize naturally. It is easy to install, requires minimum maintenance, has a high recovery value, and lowers mining costs. Bethlehem Pacific Coast Steel Corp., San Francisco, Calif. (85)

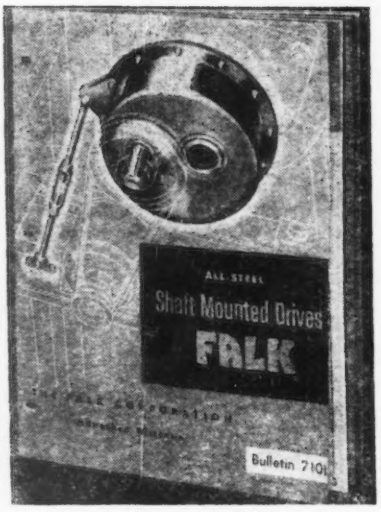
**CONVEYOR BELT.** A new color chart for standard conveyor belt constructions by Quaker Rubber Corp., Philadelphia, Pa., graphically shows theoretical ultimate strength; actual ultimate strength; fastener strength; operating strength with fasteners; operating strength with splice; troughing index. (86)

**LABORATORY FLOTATION.** Two Fagergren laboratory flotation machines for research and commercial testing of ore, reagents and pulp mixtures are described and illustrated in a new bulletin, L-1-F-1 prepared by Western Machinery Co., San Francisco, Calif. (87)

**ENGINES.** A 6-page brochure announces the new Power Giant power units offered by Willys Motors, Inc., Toledo, Ohio. Complete specifications of engines, standard equipment and housing are given. Includes horsepower, torque and fuel consumption figures of four 4 and 6 cylinder Power Giant engines. (88)

**STRIP MINING.** "Stripping for Metal," 12-page booklet written for the strip mining industry and released by Caterpillar Tractor Co., Peoria, Ill., should be of special interest to all mine owners and operators. Depicting many products of the company's line from rubber tired tractors and scrapers to track-type tractors and diesel engines, the book contains more than 15 photographs of Caterpillar machines engaged in mining jobs. (89)

**QUICK DISCHARGE VALVE.** Stainless steel discharge valve for use on all types of truck tanks, designated as Chem-Valve, eliminates such troublesome problems as clogged outlets caused by congealing liquids and the heating of these outlets before unloading. Illustrated folder gives complete details. Chem-Valve Corp., Kenvil, N.J. (90)




**SHAFT MOUNTED DRIVES.** In only 8 pages this Bulletin 7101 contains all essential information about these modern gear drives which give users highly efficient speed reduction in limited space at low initial cost and installation expense. If you use machines which require input speeds between 420 and 10 rpm in the ½- to 30-hp range, you'll find the design data, selection tables, dimensions, weights in this brochure extremely helpful. Falk Corp., Milwaukee, Wis. (91)

**VIBRATING SCREEN.** Improved Mesabi vibrating screen, built specifically for severe service applications, is the subject of a 16-page bulletin published by Pioneer Engineering Works, Inc., Minneapolis, Minn. Screen capacity, size selection and installation are fully covered. Bulletin is well illustrated with numerous cutaways to show mechanical details and features of design. The installation drawings, data and specifications, accompanied by text material and tables enabling proper selection of the correct screen for the job. (92)

**ENGINE COOLING SYSTEM.** Just how important is the cooling system of an internal combustion engine? Cummins Engine Co., Inc., Columbus, Ind., believes it to be just as important to an engine as the lubricating system, the fuel system or the air system. "Give The Cooling System a Chance," contains many practical suggestions on the best way to care for an engine's cooling system. The information is not only for Cummins Diesels, but may also be applied to all internal combustion engines. (93)

**VALVES.** A 16-page bulletin, 1010, covering all aspects on the complete line of standard 4-way hand, foot, power and solenoid operated valves has just been released by Ledeen Mfg. Co., Los Angeles. The bulletin also shows a new line of pilot valves. (94)

**MECHANIZED MINING.** "Modern Mining Methods" (MS-977)—giving a pictorial review of the Allis-Chalmers line of industrial equipment as applied by the mining industry, is now available from Allis-Chalmers Manufacturing Co., Milwaukee, Wis. (95)

**ORE TESTING.** The practical necessity for laboratory testing of ore processing methods and Wemco's laboratory test service are described in Bulletin L-1-C-1, along with an analysis of typical process problems and their effective solutions by Wemco's laboratory service. Western Machinery Co., San Francisco, Calif. (96)

**FILTER.** Dorfan Impingo filter for cleaning hot, wet and corrosive gases and air has been detailed in an 8-page brochure published by Mechanical Industries, Pittsburgh, Pa. Included are installation photographs, engineering drawings of filter components and complete systems. (97)

**MELTING FURNACE.** Bulletin 60 describes a new unit, the high-frequency Inducto Melter, a unique piece of equipment in which the melting table is integral with the control cabinet and power supply. Featured are two melting charts which simplify selection of proper size unit. Inductotherm Corp., Glenolden, Pa. (98)

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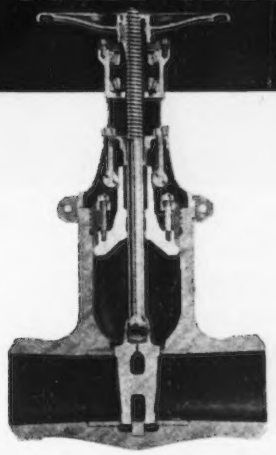
*Better because* ... **They have no bonnet flanges, bonnet bolts, or bonnet welds. Ideal for high-pressure, high-temperature steam service and corresponding boiler feed service, Walworth Pressure-Seal Cast Steel Valves weigh less, and take up less space than the flanged bonnet type of valves used for similar services.**

These are a few of the important advantages made possible by the design of Walworth *Pressure-Seal* Cast Steel Valves. Internal line pressure is utilized within the bonnet to maintain a tight, leakproof, body-to-bonnet connection under all normal operating conditions. The higher the pressure, the tighter the seal.

Ask for your copy of Walworth Circular 143. It gives detailed information, including sizes, dimensions, and specifications for all Walworth Pressure-Seal Cast Steel Valves.



**Cross section of 8-inch Series 900 Walworth Pressure-Seal Cast Steel Gate Valve. Pressure-Seal Globe, Check, Angle, and Non-Return Valves are also available in Series 600, 900, 1500 and 2500 in a wide range of sizes.**

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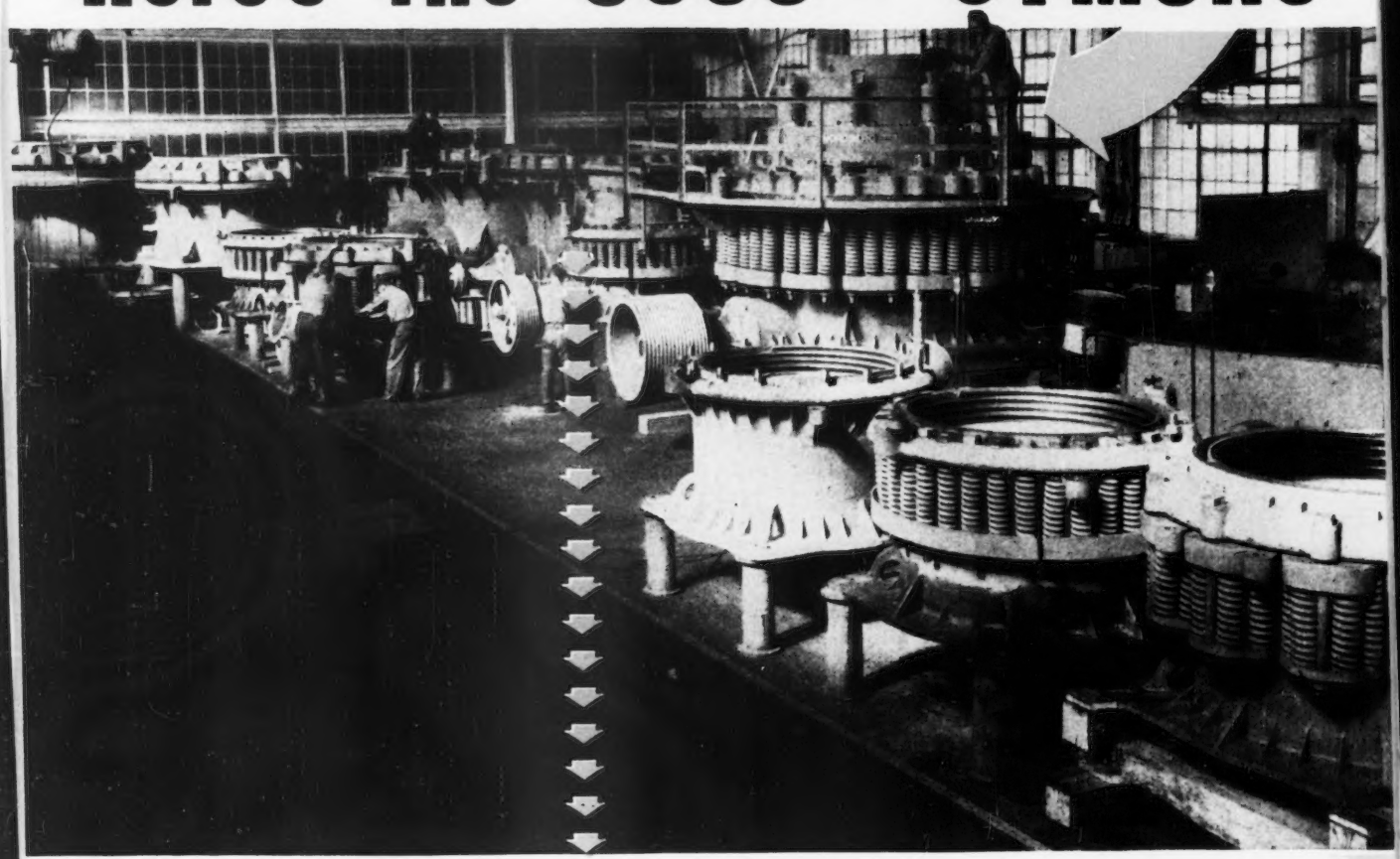
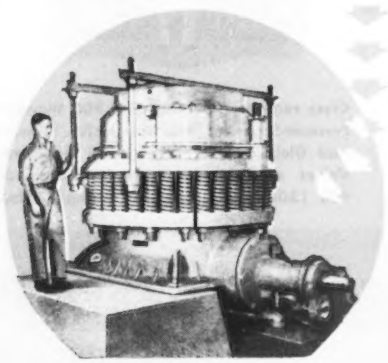


**...and here is SYMONS CONE CRUSHER No. 5001... built for one of the world's outstanding Slag Producers**



*With the 5,000th SYMONS CONE CRUSHER completed, production on Number 5001 was well along . . . a 4′ standard crusher scheduled for delivery to one of the world's largest slag producers—who have installed a total of 63 SYMONS CONE CRUSHERS for the dependable, profitable crushing of huge tonnages of slag.*

*This installation points up the important fact that a large proportion of all SYMONS CONES in service are* repeat orders *from satisfied users. For example, here are just a few fields in which SYMONS CONES are used, and the number of repeat orders placed by* single *users in each field:*

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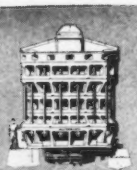
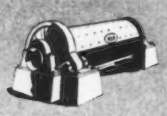
| GOLD | 8 | REFRACTORIES | 12 |
| GRAVEL | 18 | STONE | 39 |



SYMONS GYRATORY CRUSHERS



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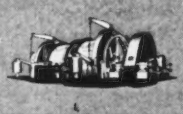

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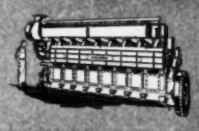

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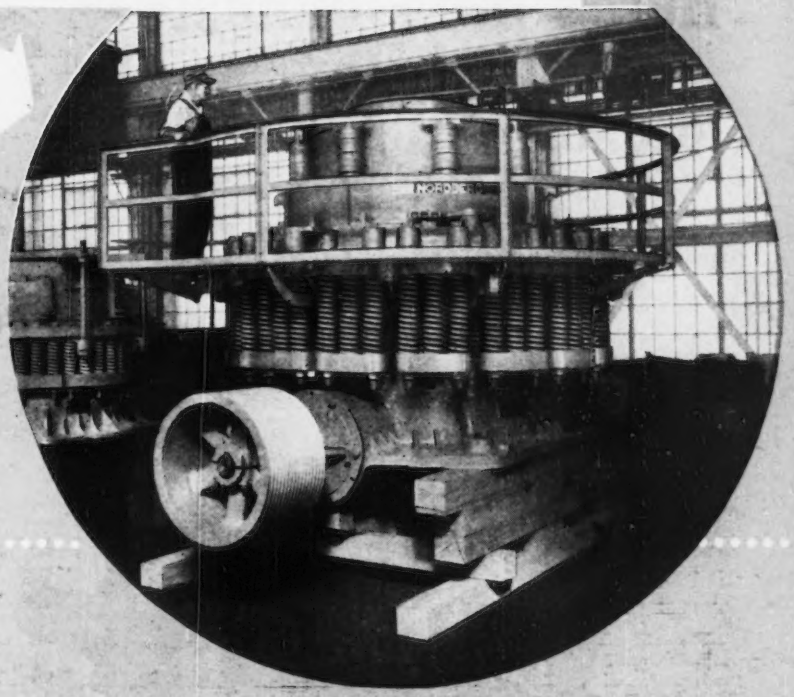
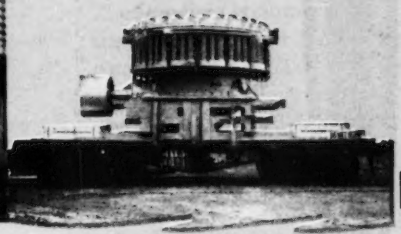
**A RECORD MADE POSSIBLE THROUGH REPEAT ORDERS OF THE WORLD'S LEADING PRODUCERS OF ORES AND INDUSTRIAL MINERALS**





**No. 5000 . . . one of 37 Super Heavy 7-ft. SYMONS CONES destined for the Lake Superior Iron Ore Region to process TACONITE**

● The introduction of the SYMONS CONE CRUSHER, little more than a quarter of a century ago, marked a new era in fine reduction crushing operations. No other type of crushing machinery ever received such enthusiastic acceptance . . . and today its world-wide use is unparalleled.

A typical example of this universal acceptance is the fact that this *5,000th* SYMONS CONE CRUSHER will soon be installed in the Lake Superior Region—one of 37 Super Heavy 7-ft. SYMONS CONES that have been given the difficult assignment of crushing the hard, tough Taconite Iron Ores.

For in Taconite . . . *as in all of the great ore and industrial mineral operations the world over* . . . there has been no record to equal the performance of SYMONS CONE CRUSHERS that have so consistently and efficiently produced great quantities of finely crushed product at low cost. *These, then, are the machines that have truly revolutionized modern crushing practice!*

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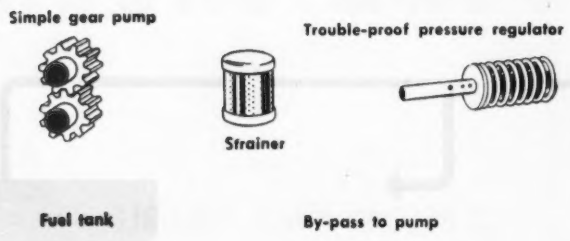
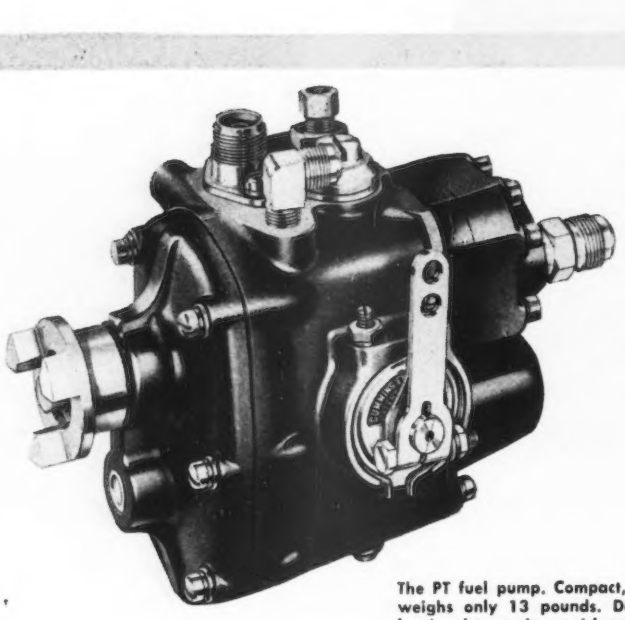
# Here's the simplest diesel fuel system ever developed!

**Simplest pump and fuel control arrangement**




## *Cummins new* PT *fuel system...*



The PT fuel pump. Compact, easy to handle, weighs only 13 pounds. Does not have to be timed to engine, quick and easy to install.

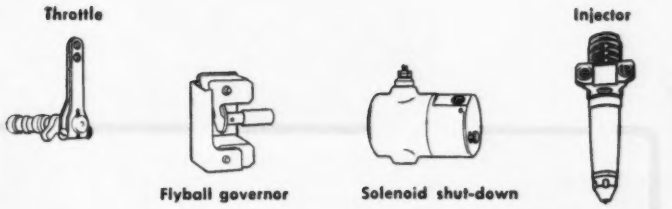
The PT injector utilizes the exclusive Cummins principle of fuel injection which has set the highest standards of performance and economy for more than 20 years.

THE revolutionary new PT fuel system, now standard on all Cummins Diesels, has fewer and far simpler parts than carburetor and ignition systems or ordinary diesel fuel systems. It is easy to understand, simple to work with, can be serviced by any mechanic. No longer any need for fuel system specialists! The PT fuel system has undergone two years of field testing and millions of operating miles under every conceivable condition. Its dependability record is phenomenal. Operators report even less fuel consumption than with earlier Cummins fuel systems and far less cost of maintenance. The PT fuel system can be installed on any Cummins Diesel built since 1932.

# Cummins

***leader in lightweight high speed diesel power***

Cummins Diesels (60 to 600 h.p.) are built for and used by original equipment manufacturers in highway trucks, off-highway trucks, power shovels, scraper units, buses, motor graders, logging yarders and loaders, oil well drilling rigs, electric power generators, irrigation systems, work boats, and pleasure craft.




**PT advantages over gasoline systems:**

| | |
|---|---|
| No contact points to adjust | No vapor-lock problems |
| No condenser to replace | No flooding |
| No spark coil to short | No choking or priming |
| No wiring harness to short | No needle valves to clog |
| No spark plugs | No butterfly valve |
| | No float level to maintain |
| | No float valve to stick |

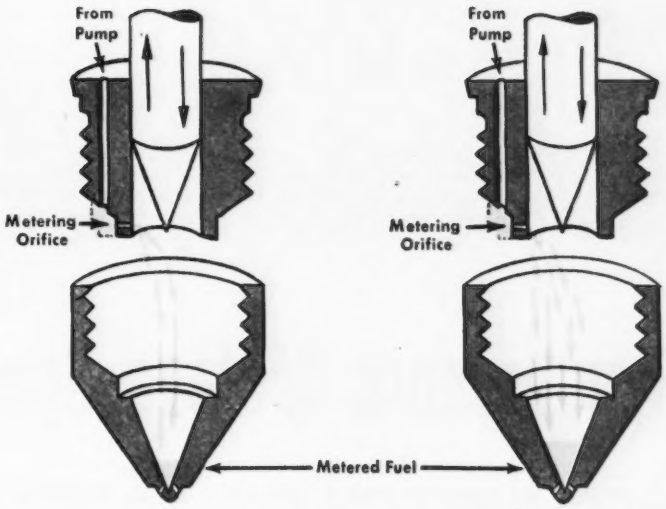
**PT advantages over ordinary diesel systems:**

| | |
|---|---|
| No fuel rack adjustments | No distributor discs |
| No check valves | No metering pumps |
| No needle valves | No high-pressure fuel lines |
| No helixes | No fuel pump timing |

## *. . . simpler to work with than gasoline carburetion and ignition*

### Simplest Fuel Metering Device

The principle is simply that the amount of fuel flowing through a fixed orifice varies according to the amount of pressure on the fuel. Pressure is controlled by the throttle on the PT pump. Fuel flow through orifice is cut off as injector plunger, actuated by engine camshaft, moves down to inject fuel.




When engine is under partial load, fuel pressure is low, and only a small amount of fuel passes through orifice into injector cup.

When engine is under full load, fuel pressure is increased, and greater amount of fuel passes through orifice into injector cup.

**Mail this today, and get more PT facts!**

**CUMMINS ENGINE COMPANY, INC., Dept. EM-12**
**Columbus, Indiana**

Please send me free illustrated folder, "Cummins PT Fuel System."

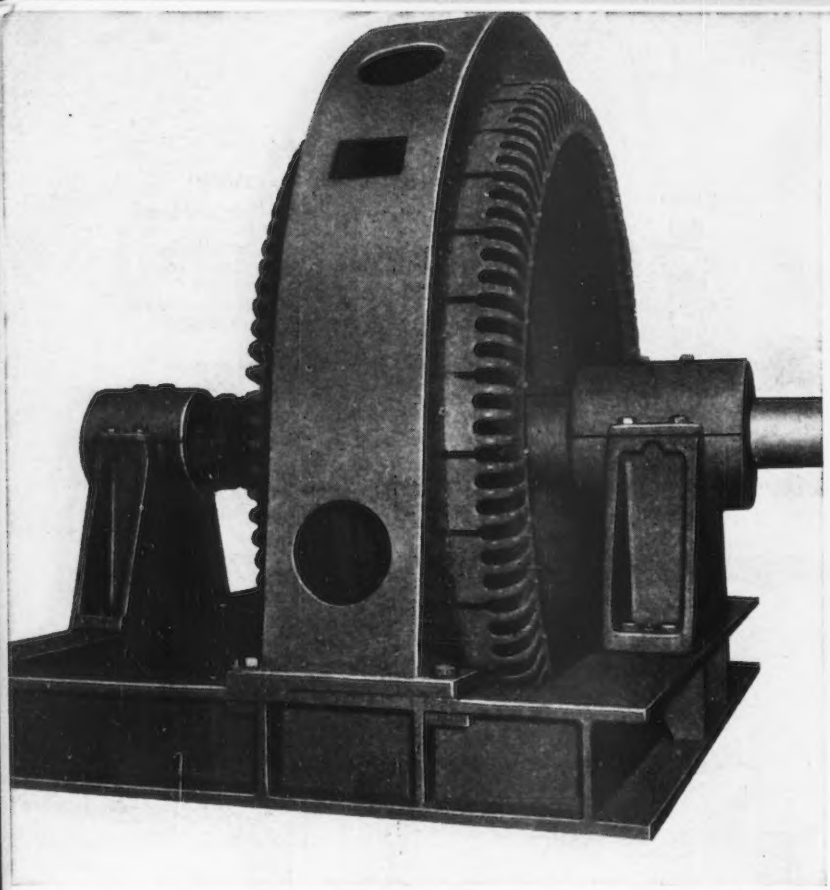
Name_____

Company_____

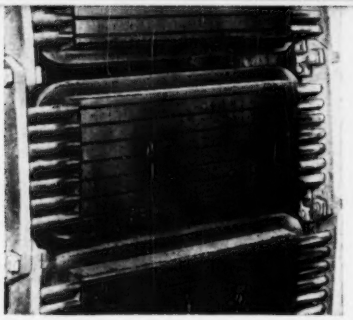
Address_____

City_____ Zone____ State_____

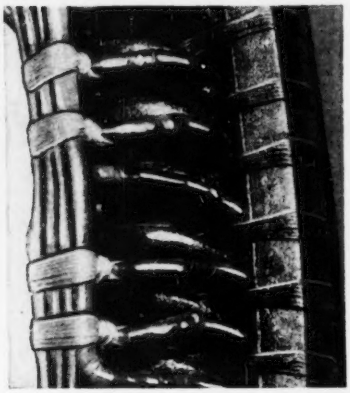
**CUMMINS**



**A G-E SYNCHRONOUS MOTOR,** matched to your ball mill, is modern in design, neat in appearance, and built to give years of safer, more dependable service. Strength and rigidity are assured by fabricated construction and careful annealing of steel in rotors. Special coil and connection reinforcement gives extra protection to withstand the vibration and shock inherent in ball-mill operation.



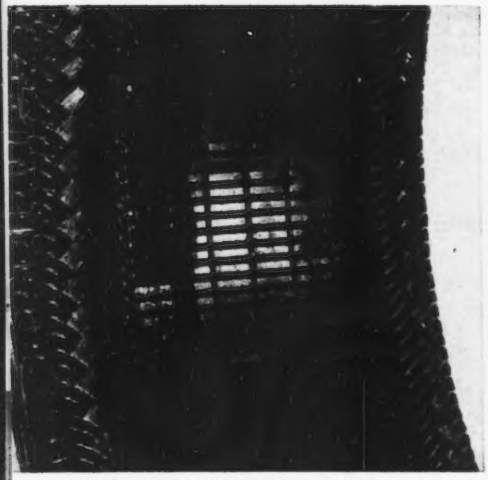
**END SEGMENTS** are sectionalized and securely bolted between poles. This rugged squirrel-cage winding assures ample strength for long motor life.



**DIMENSIONALLY STABLE CORD** holds the armature coils (and end connections) securely to an insulated support ring. This special cord resists the effects of moisture absorption and (cyclical) temperature changes, keeps tension tight, helps assure long insulation life.

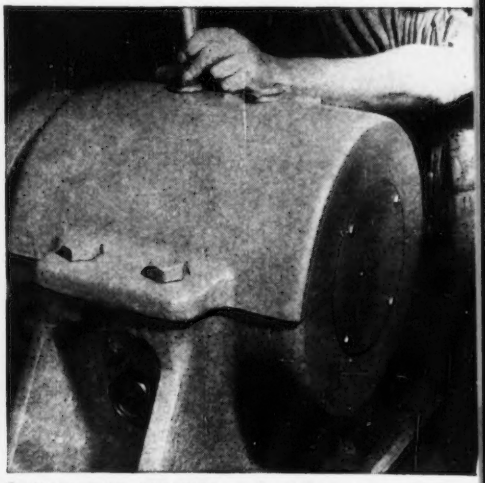
# G-E Synchronous Motors Specially Designed

***RAPID, ROUTINE MAINTENANCE MEANS LESS DOWNTIME BECAUSE . . .***

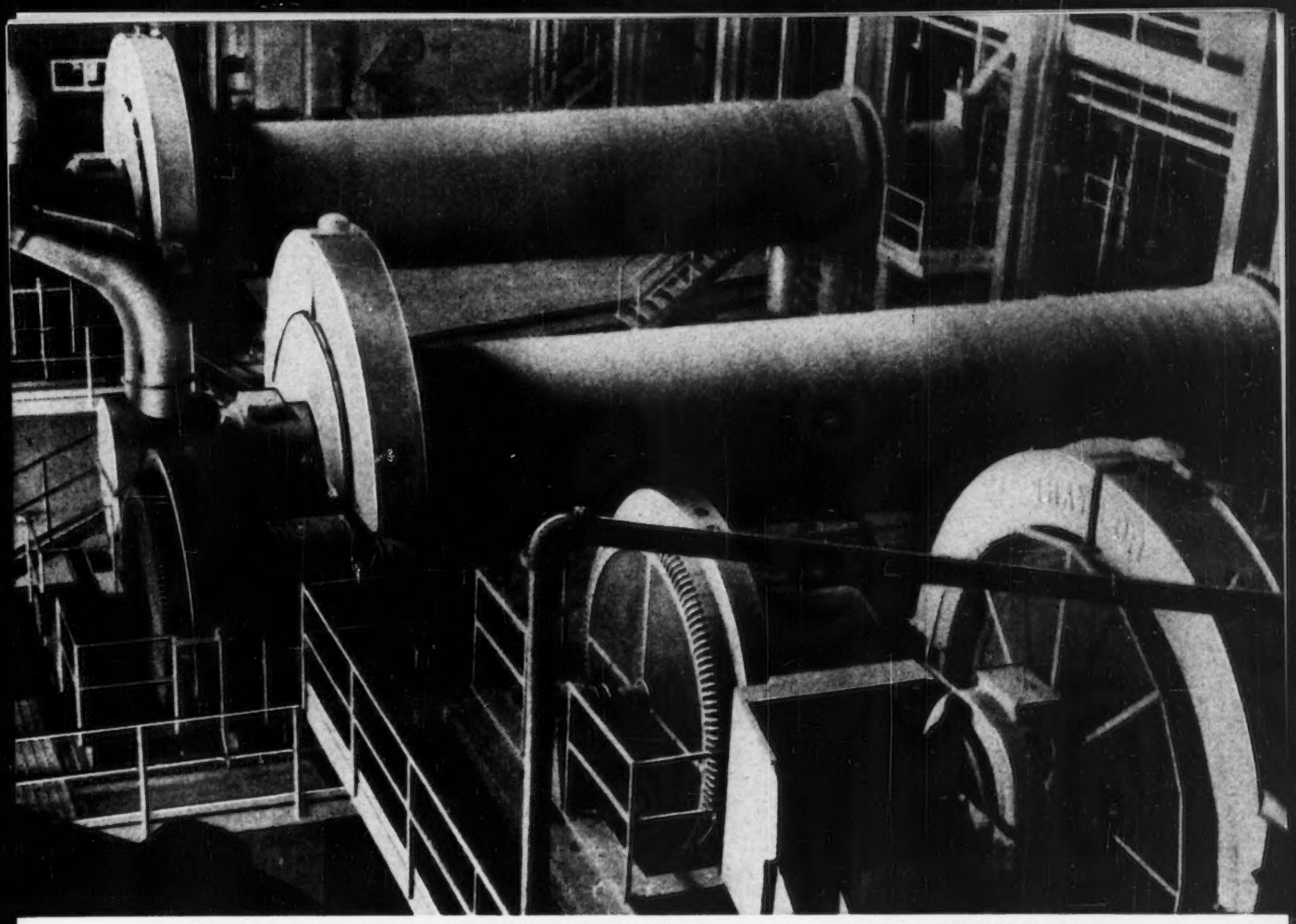


**1 GLOSSY VARNISH** on windings acts as moisture barrier, resists dust adhesion, cleans easily. Clean windings mean longer insulation and machine life.

**2 BRUSH-PRESSURE ADJUSTMENT** is fast and easy with spring-loaded holder. Brushes are staggered for uniform wear, give maximum collector-ring life.



**3 SNAP-TOP COVERS** and sight gage make lubrication fast and sure. These convenient features encourage regular checking of oil level.



THREE G E, TYPE TS, 180-RPM SYNCHRONOUS MOTORS DRIVE TRAYLOR BALL MILLS IN THIS LARGE WESTERN PLANT.

# for Dependable, Economical Ball-mill Service

Ball mills are one of industry's "tough" drive applications. Motors must be able to meet torque requirements, withstand vibration, and run long periods without shutdown.

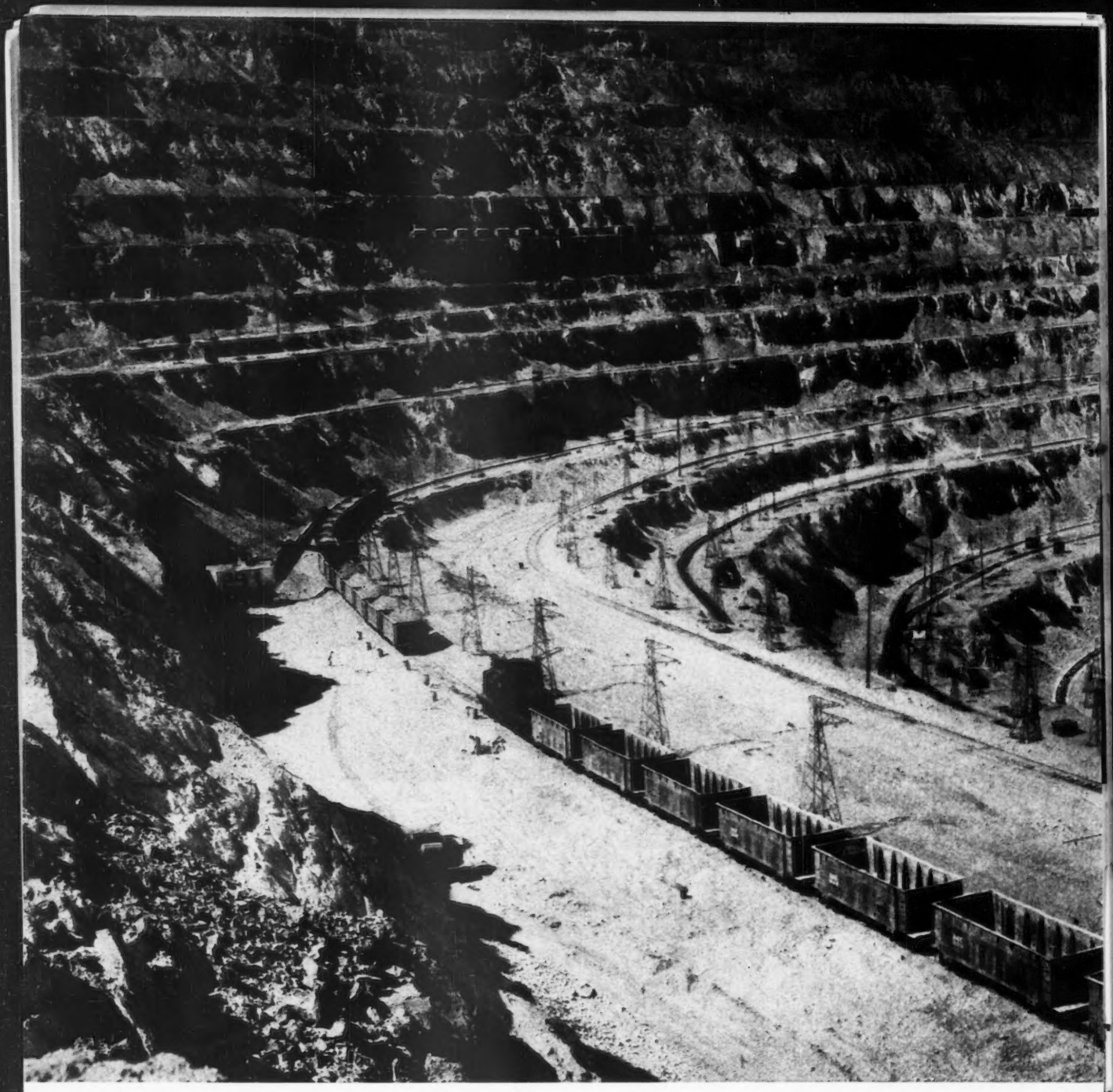
G-E synchronous motors are literally tailor-made to meet these requirements. Engineering and manufacturing experience obtained in building hundreds of motors for ball-mill drives and the proved dependable performance of G-E synchronous motors on all types of heavy-duty applications assure you of a motor that will withstand unusual demands and require only a minimum of maintenance expense.

Be sure to evaluate the special design features of G-E synchronous motors when you consider your next ball- or rod-mill drive.

Contact your nearest General Electric office for bulletin GEA-5959—*Synchronous Motors for Ball- and Rod-Mill Drives* or write to Section 770-30, General Electric Company, Schenectady 5, N. Y.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC



# IMPOSSIBLE WITHOUT EXPLOSIVES

In 50 years of mining operations by the Utah Copper Division of Kennecott Copper Corporation, Bingham Canyon has yielded more than 694,000,000 tons of copper ore. That's a lot of ore and it called for millions of pounds of industrial explosives, skillfully used, to break the ore loose from working faces, assure efficient shovel operations, and quick transportation to crushing and washing plants.

Explosives have been Hercules' business for 40 years. Wherever industrial explosives are needed, a Hercules technical representative can assist in the selection of the right explosives and blasting supplies for the job and recommend the most efficient methods to be used.

*HERCULES POWDER COMPANY*

INCORPORATED

*Explosives Department, 933 King Street, Wilmington 99, Del.*

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Calif.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Calif.

XR54-9

# Count on MANCHA'S LITTLE TRAMMER

(STORAGE BATTERY LOCOMOTIVE)

## to do a big job — production-wise and profit-wise

Whatever the work at hand — haulage, moving mucking machines, drill jumbos, timber, powder, supplies, or man trips to distant workings — you can count on a Mancha Little Trammer to do the job dependably, quickly, and economically.

Small enough for work in narrow, crooked drifts, and powered by a rugged, heavy duty motor, the Little Trammer stands up under severe operating conditions — does a whale of a job, with complete safety for the motorman, and with minimum expense for operation and maintenance.

OPERATING WT., 1½ TONS
The hinged cab of the Little Trammer raises to shorten caging length, to facilitate transfer from level to level even in small mines.

## Mancha's Little Trammers are doing a big job for mining companies all over the world

### Will Mancha's Little Trammer pay in your mine?

You can find out quickly and easily. Just mail the coupon for our "mine haulage data form." The information you provide will be analyzed by Mancha Engineers, who will then tell you what economies you can effect with the use of this storage battery locomotive. Mail the coupon today. There's no obligation.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E&MJ-1254

Send your mine haulage data form.

NAME _____

FIRM _____

ADDRESS _____

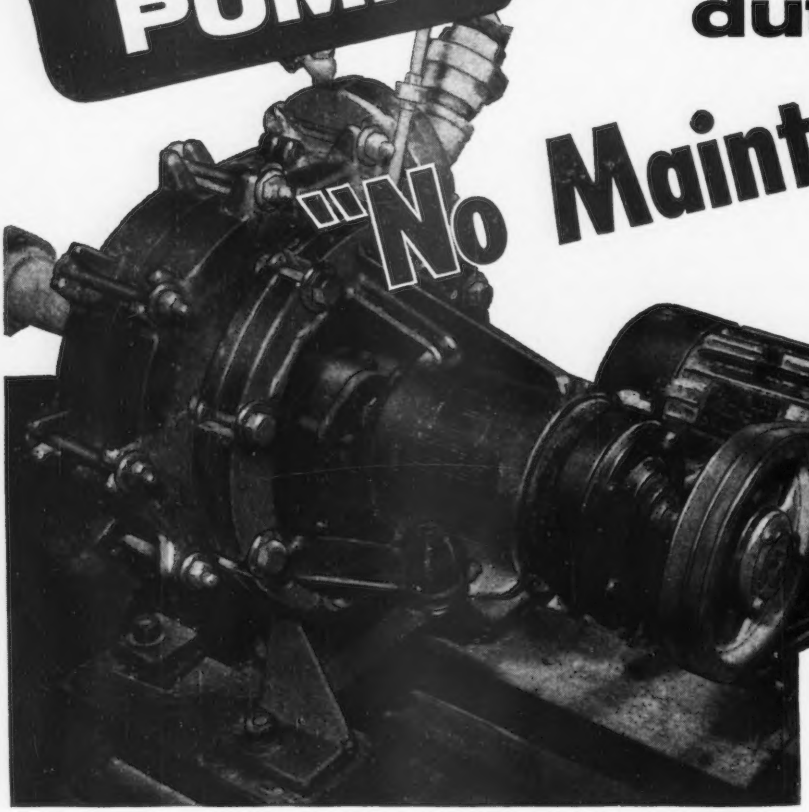
CITY _____ ZONE _____ STATE _____

**MANCHA STORAGE BATTERY LOCOMOTIVE**
Division GOODMAN Manufacturing Company
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

ALLIS-CHALMERS

Rubber-Lined PUMP

# In 7 months' continuous duty... "No Maintenance"



Allis-Chalmers pump, motor, *Texrope* V-belt drive and motor starter operated by Georgia Coating Clay Co., at Macon, Georgia. By specifying A-C for all components you get coordinated design — the benefits of dealing with a single source for service and supply and having one reliable firm responsible for the complete unit.

## Georgia Coating Clay Co. uses A-C Rubber-Lined Pump to move highly abrasive clay slurry

SINCE ITS INSTALLATION IN MARCH, 1954, this Allis-Chalmers Rubber-Lined Pump has been operating "round the clock," handling 17% to 36% clay slurry with pH ranging from 5.0 to 7.0. The previous pump required impeller replacement about every six weeks.

### Long Life, Lasting High Efficiency

With Allis-Chalmers Rubber-Lined Pumps you can make adjustment to maintain proper clearances between the impeller and the casing. This adjustment — which prolongs pump life and efficiency — is merely a matter of resetting adjusting screws. Owners report A-C Rubber-Lined Pumps last from 10 to 50 times as long as hard alloy pumps.

### GET ALL THE FACTS . . .

Find out how these new pumps help you maintain high output, cut maintenance, service and down-time costs. See your representative or write Allis-Chalmers, Milwaukee 1, Wis. Ask for Bulletin 52B8156. A-4486

*Texrope* is an Allis-Chalmers trademark.

# ALLIS-CHALMERS

Model 145 Dart Truck equipped with Allison TORQMATIC DRIVE being loaded at Sunnyhill Coal Company's New Lexington, Ohio, mine. Truck is one of 10 operated by Sunnyhill.

# 10 trucks replace 30 – cut costs 62%

WHEN 10 50-ton trucks equipped with Allison TORQMATIC DRIVES replaced 30 mechanical-drive 20- and 30-ton trucks at Sunnyhill Coal Company's New Lexington mine:

*Operating costs* dropped *18.6¢ per ton,*

*Maintenance costs were* cut *13.1¢ per ton,*

*And the* TORQMATIC-*equipped trucks now haul 32.6* more *tons per truck hour.*

But lower costs are only part of the story.

On-the-job accidents have dropped sharply. Drivers stay fresher, more alert because they now have no clutch pedal to push – quick-shift at full throttle with finger-tip hydraulic control—have only 3 shifts instead of 7 or 10.

Wet weather worries have almost disappeared—road maintenance costs are lower. Smooth power transmission by the Allison TORQMATIC DRIVES lets trucks drive through mud and muck—conditions that often shut down the mine before TORQMATIC-equipped units came on the job.

Big reason for lower operating and maintenance costs is shock-free power transmission by the *matched* TORQMATIC Converter-Transmission teams. The Converter absorbs shock loads instead of transmitting them along the drive line—protects engine, differential, drive shaft and transmission from damage.

There's an Allison TORQMATIC DRIVE for your 40- to 400-horsepower gasoline and Diesel equipment. New low-cost 40-150 h.p. TORQMATIC Converters easily fit present equipment, are completely self-contained for simple installation. Get full details about Allison TORQMATIC DRIVES from your equipment manufacturer or dealer or write:

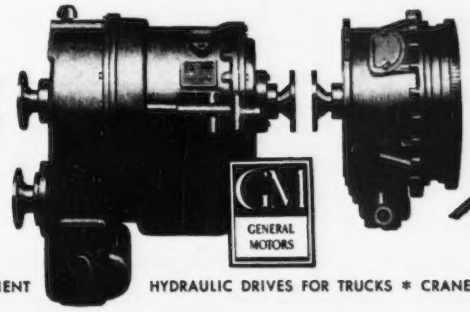
Allison Division of General Motors
Box 894M, Indianapolis 6, Indiana

## ALLISON TORQMATIC DRIVES

**Unbeatable Team for Maximum Operating Economy**

- **Quick-Shifts** at full throttle with finger-tip hydraulic control
- **Holds** power to load at all times – no clutch pedal to push—no gearshift guess
- **Reduces** maintenance costs by absorbing shock – eliminates engine lugging – prolongs equipment life
- **First** torque converter-transmission team designed to work as a *unit* and built by one manufacturer
- **Cuts** driver training costs

FIRST MATCHED UNITS BUILT BY ONE MANUFACTURER




Allison TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR TRUCKS * CRANES * TRACTORS * SCRAPERS * SHOVELS * DRILLING RIGS

# STURTEVANT

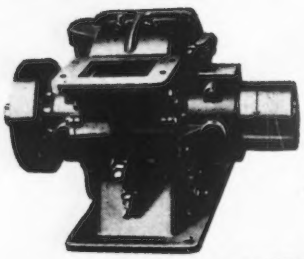
## Laboratory Equipment...

### assures accurate samples... cuts laboratory sampling costs

Sturtevant laboratory equipment have all the features of full-sized production machines with extra accuracy and wider range of adjustment built-in. They are fast... provide true samples of every batch processed.

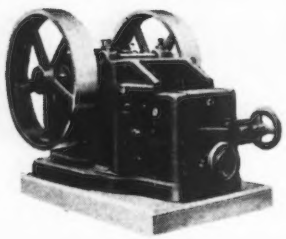
All Sturtevant machines have "open-door" accessibility which permits quick, thorough cleaning... prevents the possibility of previous batches from contaminating new samples. Their rugged construction assures round the clock operation with practically no maintenance.

Investigate Sturtevant equipment for your laboratories. They will help you cut sampling costs... improve product quality... increase sales. Write for catalog, today.



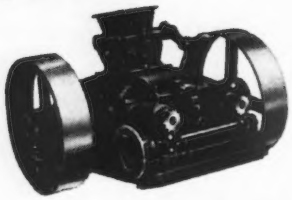
**LABORATORY SWING-SLEDGE MILLS**

Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



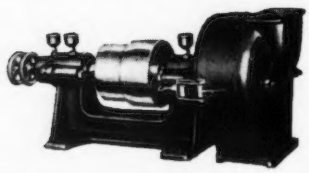
**LABORATORY JAW CRUSHERS**

Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 to 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.



**LABORATORY CRUSHING ROLLS**

First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited out-puts. Range of output for the 8 x 5 size is from ½ in. to 20 mesh — and for the 12 x 12 size from ¾ in. to 20 mesh.



**LABORATORY SAMPLE GRINDER**

Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

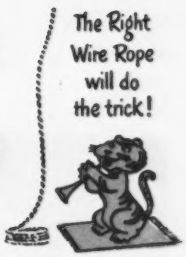
**STURTEVANT MILL COMPANY**

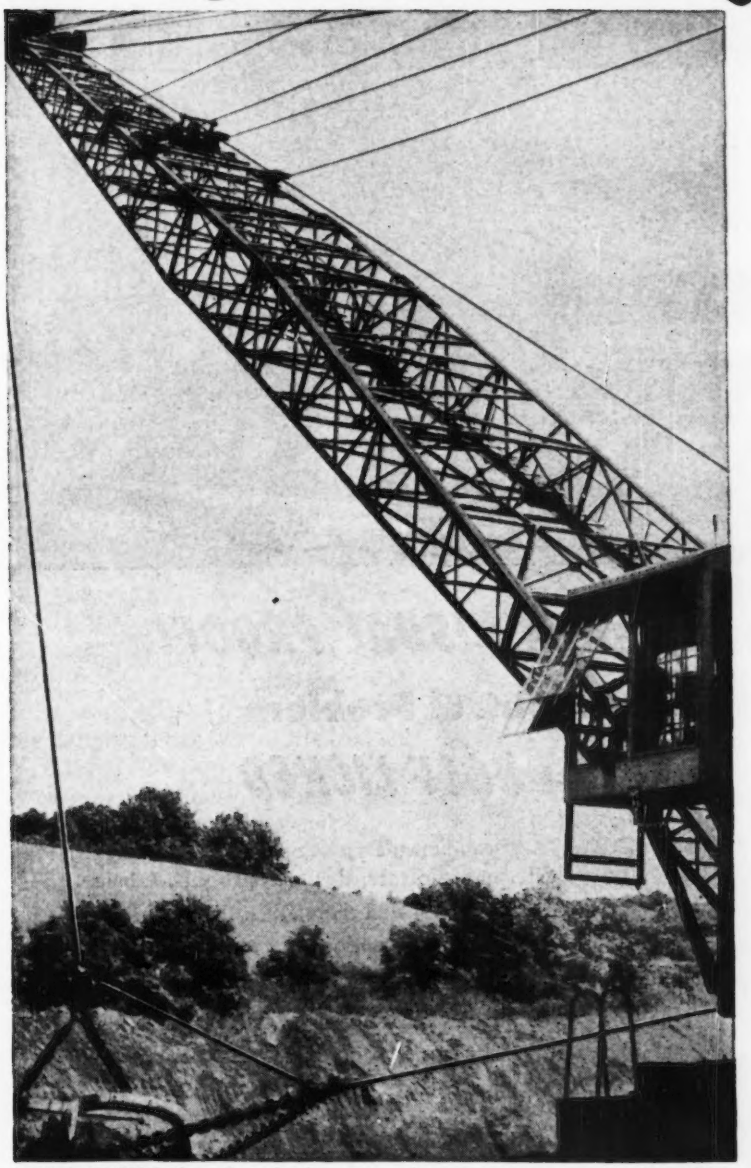
**101 Clayton Street, Boston 22, Mass.**

***Designers and Manufacturers of***

**CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS**

# TROUBLE-FREE SERVICE around the clock from Tiger Brand Drag Rope



**ASSURE YOURSELF** of good service from your wire ropes—consult an American Wire Rope Engineer regularly.

ONE of the largest coal companies in Pennsylvania gets excellent service from Tiger Brand Wire Rope. On this big dragline, for example, 2¼" Tiger Brand Drag Rope lasts for 8 to 12 weeks, and 1⅜" Tiger Brand Hoist Rope lasts 4 to 6 months. This is good service, because these ropes work 24 hours a day, 6 days a week, every week of the year.

As a result of consistently good service records like these, many such operators use Tiger Brand Wire Rope exclusively on all their excavating machinery.

Like hundreds of other companies that do a lot of excavating, you will find that once you start using Tiger Brand Wire Rope, you keep down rope costs, keep down rope trouble, and *keep on using* Tiger Brand.

For a list of Tiger Brand Wire Ropes and the jobs each one can do best, send the coupon.

FREE ROPE BOOKLET

American Steel & Wire
Dept. C-124, Rockefeller Building
Cleveland 13, Ohio

Please send me, without obligation, a copy of your helpful wire rope selection guide, "The Right Rope for the Job."

Name .....

Company .....

Address .....

City & State .....

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

**USS AMERICAN TIGER BRAND WIRE ROPE**

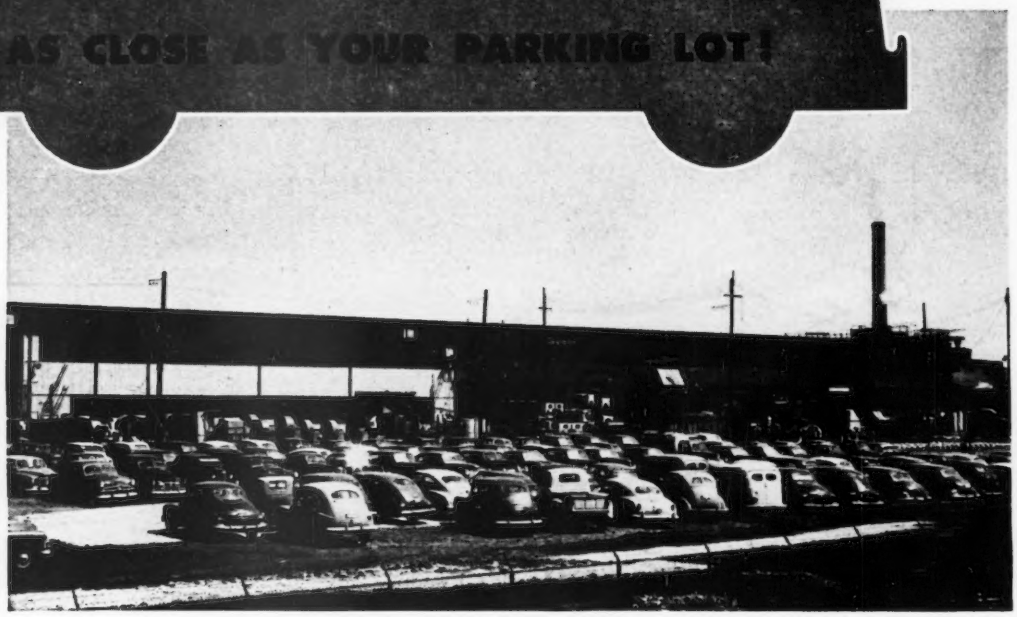
*Excellay Preformed*

USS

UNITED STATES STEEL

# AIR POLLUTION

## IS AS CLOSE AS YOUR PARKING LOT!



## Dust Covered Cars Offer *VISUAL PROOF* That a Dust Control Problem Is Just *HALF LICKED*

TAKE a look at the cars in your parking lot. They quickly show the effects of settled materials, many of which damage automotive finishes in surprisingly short periods of contact time.

If such dust is a source of irritation and expense to your employees, you can be sure that it is equally offensive to the surrounding neighborhood.

It's a problem resulting from half-way measures —solving inside dust problems at the expense of outside areas.

The solution is *complete* dust control as provided by AAF equipment. Dynamic precipitators, hydrostatic precipitators, dry centrifugals, fabric arresters—you'll find them all in the AAF line. There's a unit to cope with *any* type of dust—*completely*.

Let your parking lot be the metering device for dust conditions in your plant area. Your local AAF representative will check your dust sources and recommend effective, economical means of control. Call him today or write us direct.

**AAF EQUIPMENT DOES THE *COMPLETE* JOB —INSIDE *AND* OUT.**

AAF

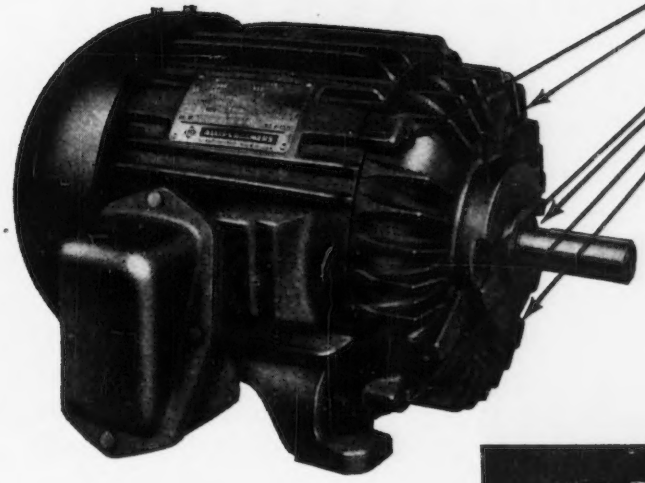
**American Air Filter**

COMPANY, INC.

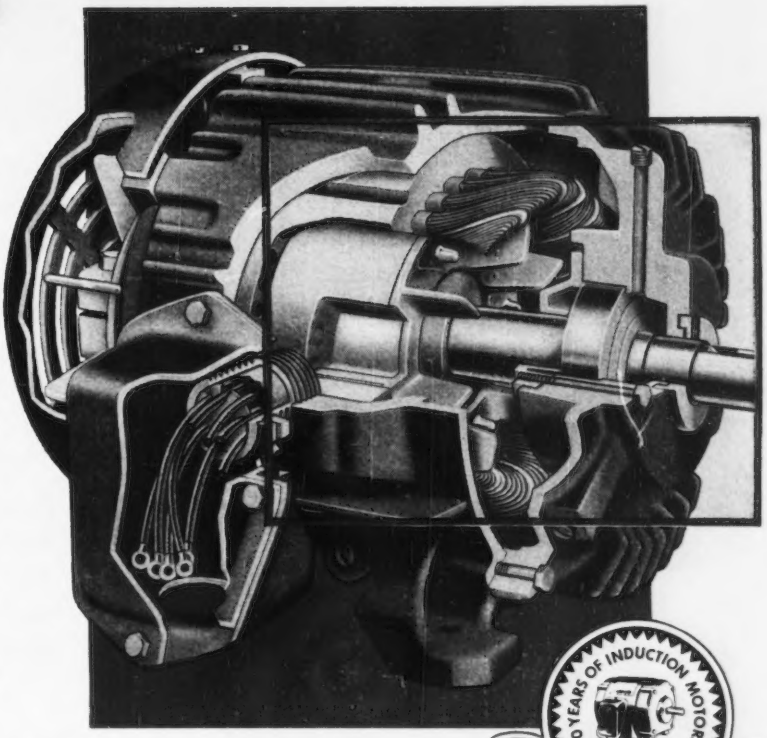
American Air Filter of Canada, Ltd., Montreal, P. Q. • 193 Centrdl Avenue, Louisville 8, Kentucky

# It takes Six Bolts –

## not just four



## to give full bearing protection for greater motor performance



THE TWO EXTRA BOLTS in the end housing of every Allis-Chalmers ball bearing motor are the proof of *extra* protection against bearing failure. These are the bolts that hold the bearing cap tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

Result? Allis-Chalmers motors pay off in longer, trouble-free bearing life, lower motor maintenance.

50 YEARS OF INDUCTION MOTORS
ALLIS-CHALMERS-NORWOOD WKS.

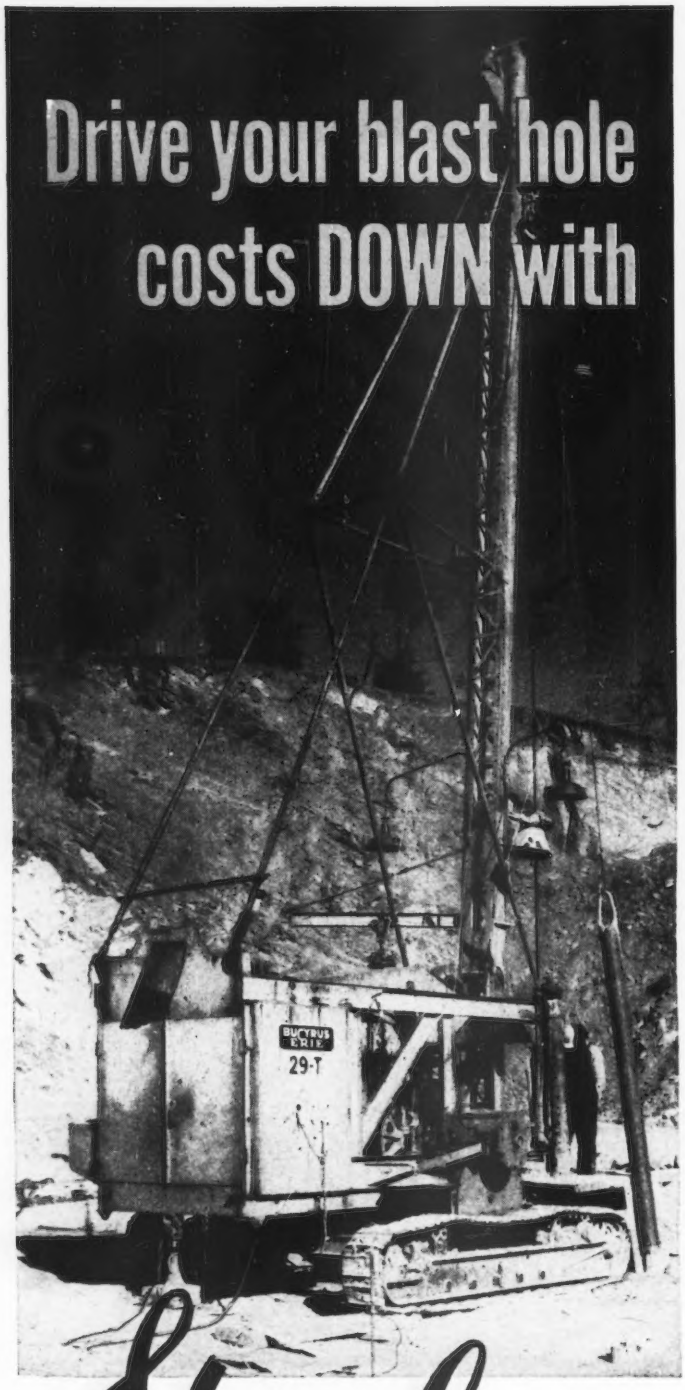
**Get all the facts . . . judge for yourself** — Compare Allis-Chalmers motors with other motors. Get the six-bolt construction that gives you complete bearing protection. For proof, see your Allis-Chalmers Office or Authorized Distributor, or write — Allis-Chalmers, Milwaukee 1, Wisconsin.

# ALLIS-CHALMERS

A-C ALLIS CHALMERS

A-4444

# Drive your blast hole costs DOWN with TIREX




Economic churn drill operation demands extreme cable dependability. High temperatures caused by summer sun and high current load, accidental run-overs by trucks, and impact against sharp rocks demand a cable with high stamina. Simplex-TIREX Portable Cables were designed and engineered especially to meet the needs peculiar to mining.

TIREX is the only portable cable that has Selenium Neoprene Armor. This armor was developed by Simplex especially for mining cables. It is the toughest, hard-service jacket known. It resists acids, alkalies, chemicals, flame, moisture, oil, and sunlight. It is *cured in lead* to provide the toughest, longest-lived jacket possible.

Churn drilling is no place for weak-kneed cable that may cause breakdowns, tie-ups, or work stoppage of any kind. For such a vital operation, buy TIREX from your nearest Simplex distributor.

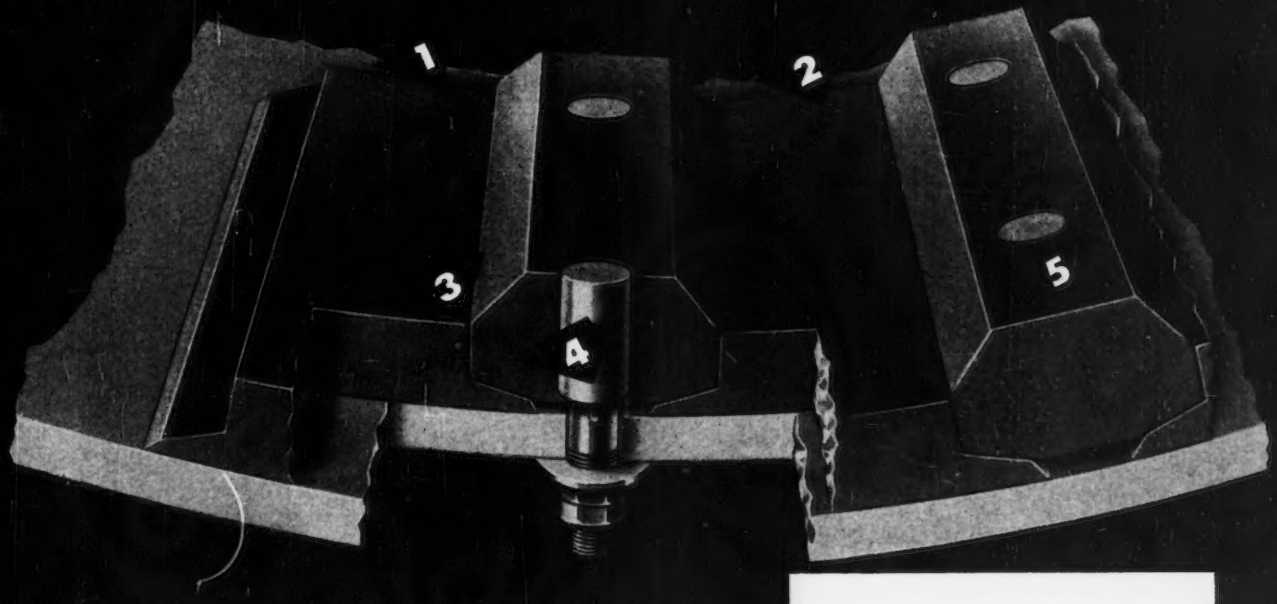
Simplex WIRES & CABLES

TIREX CORDS AND CABLES *are made only by the*

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

# USS Lorain Rolled Plate Linings

## point to more profitable grinding for you . . .




SERVICE-TESTED USS Lorain Rolled Plate Linings are designed right and made right of the right kind of steel to save you money on each ton you grind. They cut down considerably on mill "down time" because they last much longer than cast linings and they are so easy to replace when it finally becomes necessary.

There are USS Lorain Rolled Plate Linings made to fit any type of mill—for wet or dry grinding. Be prepared for your next replacement . . . send today for names of leading mill manufacturers who can supply you with USS Lorain Rolled Plate Linings.

USS Grinding Balls can help you get better grinding results, too. They are made of special composition steel to take long, rough wear evenly. Samples from each production lot are thoroughly tested. Available in sizes from ¾" to 5".

**1.** Plates are interchangeable. Heat treating compensates for localized wear. You get complete grinding value from each plate.

**2.** Plates made to accurate size . . . go in faster, easier.

**3.** Tight fit between plates and between plates and lift bars eliminates shell wash and allied troubles.

**4.** Support for bolt head is near bottom of bar . . . bolts are effective for life of the lining.

**5.** Lift bars designed for correct cascade action. Height of lift varied to suit conditions.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

## USS LORAIN ROLLED PLATE LININGS *and* USS GRINDING BALLS

4-2286

UNITED STATES STEEL

# The World's Mightiest CATS require the RIGHT STEEL...

...for only the RIGHT STEEL can withstand the rugged day's work for which **CATERPILLAR** has been famous for 50 years!

Above is the new Caterpillar D8, known as the "Boss of the Crawlers." It's a masterpiece of design; it's packed with power; and of course it's built of sturdy, dependable steel.

Through the years, the people at Caterpillar have pioneered in the development of earth-moving equipment. They know just the kind of equipment needed—and they know what material to use to build efficiency, top performance and long life into that equipment. Their specifications for steel are rigid. Only the highest quality steels with exactly the *right* properties are acceptable. And that's why J&L steels have been consistent performers for Caterpillar.

You, too, can depend on J&L steels in your products and insure their reputation for top performance and long-lasting service. And J&L steels may well be the *right* steels for you.

J&L STEEL

*Jones & Laughlin*

STEEL CORPORATION — *Pittsburgh*

# *AIR CONTROLS mean you'll Move More with a* MICHIGAN

Get right into the cab of a MICHIGAN* excavator-crane, stand behind the operator—and get an eye-full of the *right way to get more yardage.*

Notice how easy it is to operate these air control levers! Notice the sure, light touch, and the instant response of clutch rams—the swift thrust of massive power—the fast, smooth swing—the perfect "feel" of the load throughout the full operating cycle. They add up—to bigger yardage!

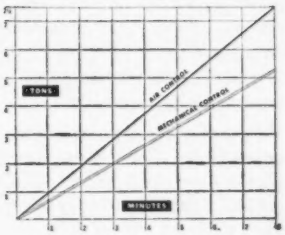
By saving seconds on every operating cycle, your air-controlled MICHIGAN can add as much as a full working hour or more to a day—and adds substantially to the amount of profit-making work done. Equally important, Air Controls are easy on the operator—don't tire him, keep his efficiency high all day.

By all means, get and read "More Yardage Through Air Power"—an attractive illustrated book that tells the full story of MICHIGAN Air Controls. A copy of it is included in the MICHIGAN "24" Fact Folio—with specifications and action photos. The coupon brings your copy—promptly.

## COMPETITIVE TEST PROVES AIR CONTROLS FASTER

"Recently another company rented our MICHIGAN—and ran a test against their own mechanically operated crane. The machines were of equal capacity—the operators judged equal in skill."

"In 8 minutes the MICHIGAN loaded 7½ tons, against 5¼ tons by the other machine—a 43% victory for Air Controls." Suisman & Blumenthal, Hartford, Conn.




*A Trademark of Clark Equipment Company

18

CLARK EQUIPMENT

Construction Machinery Division
CLARK EQUIPMENT COMPANY
436 Second Street, Benton Harbor, Mich.

Please send the MICHIGAN "24" Fact Folio

Name_____ Title_____

Firm_____

Address_____

City_____ County_____ State_____

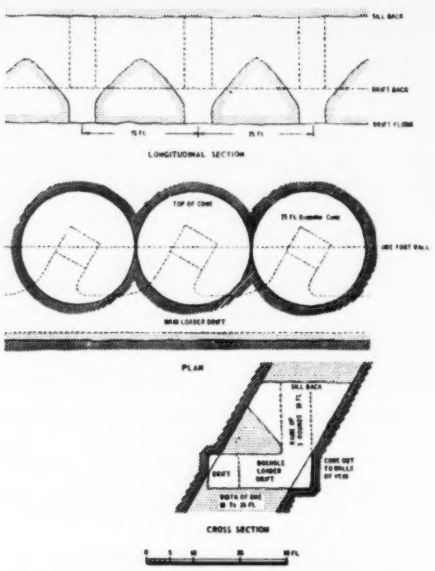
# INCREASE PRODUCTION LOWER COSTS

Yes! You can increase production and lower costs by using Eimco loaders to load your production tonnage.

The advantages of being able to load larger pieces, use less powder, practically eliminate secondary blasting and absolutely eliminate expensive chutes and grizzlies, will enable your mine to get into production in a new area faster at less expense.

That's why so many mining men are traveling to see mines that have changed their systems to production loading with Eimcos.

Many different ideas for saving time and lowering costs have been developed by operators to fit their particular conditions. A sketch of one of these is at right. Eimco engineers have helped work out numerous systems, they will be glad to help you. Write Eimco for information.

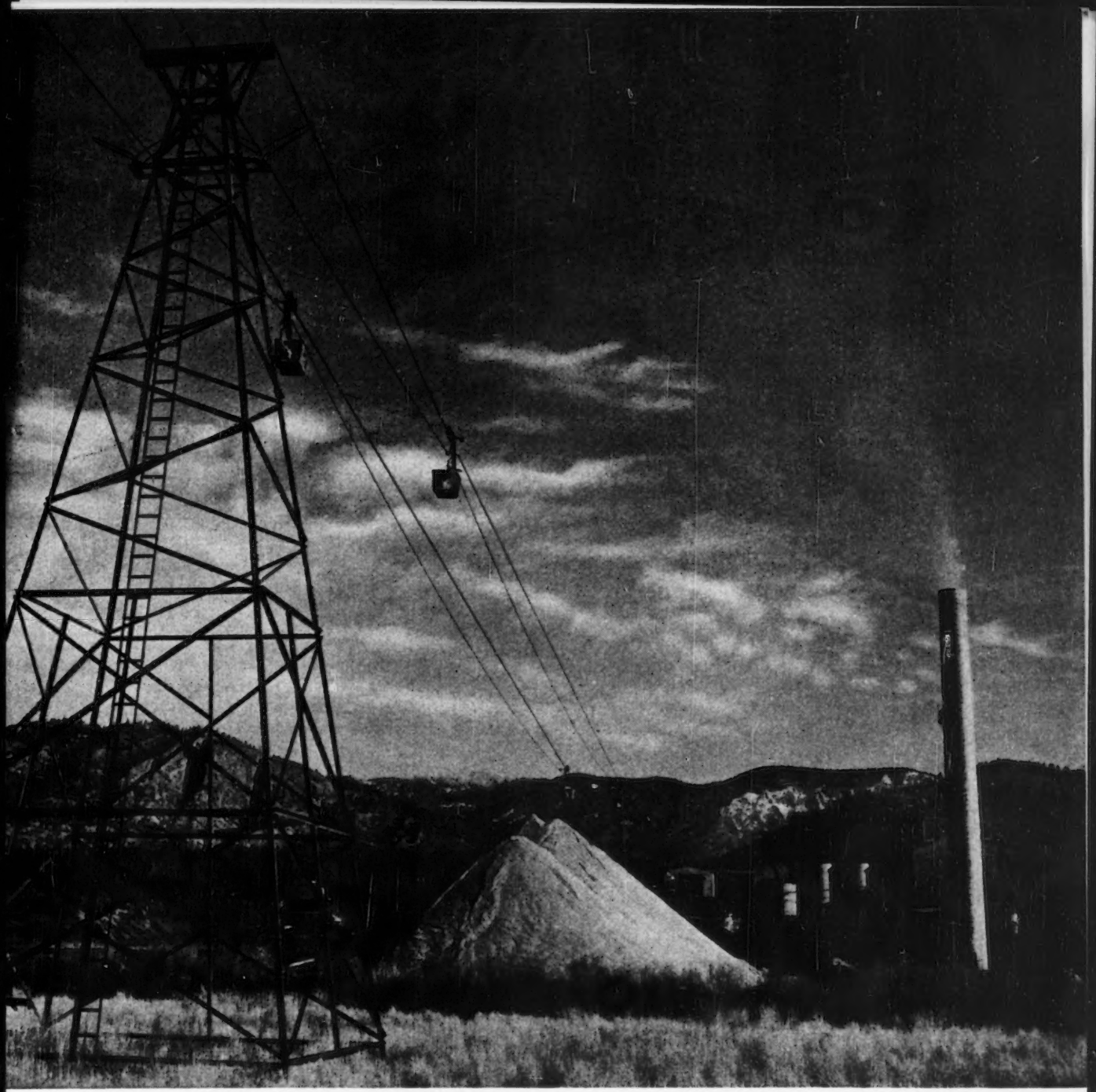



**THE EIMCO CORPORATION**

**Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City**

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

*You Can't Beat An Eimco*



**Wire Rope at Work**—Near Chewelah, Wash., is the 13½-mile aerial tramway serving the properties of Northwest Magnesite Co. Built in two sections by Riblet Tramway Co., the system hauls magnesite to the concentrating mill, thence to the big reduction plant. It is one of the finest aerial carriers ever constructed, and one of the longest to be found anywhere in this country.

The system depends in large measure upon sturdy wire rope, and approximately 140,000 ft of Bethlehem traction ropes haul buckets on both legs of the tramway. These ropes consist of 1-in. 6 x 19 on one section, ¾-in. 6 x 7 on the other—Purple Strand grade, of course, for maximum strength and toughness.

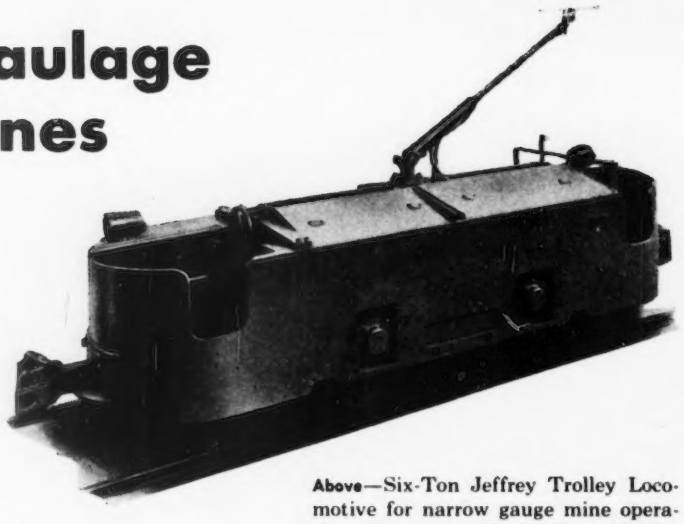
Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

*Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:*
MINING • CONSTRUCTION • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

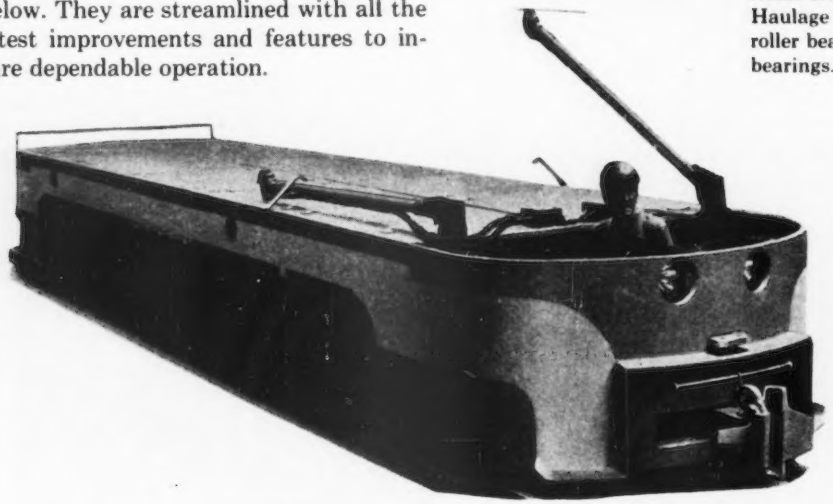
# dependable haulage for metal mines at *low cost*

Jeffrey builds a complete line of Metal Mine Locomotives – Trolley and Storage Battery or a combination of the two. Yes, there is a type and size to meet any haulage condition.

They are rugged, easy to operate and fully protected against water dripping from above or splashing up from below. They are streamlined with all the latest improvements and features to insure dependable operation.



**Above**—Six-Ton Jeffrey Trolley Locomotive for narrow gauge mine operations. Drawbar pull (level)—3000 lbs. Haulage capacity—150 gross tons with roller bearing cars; 100 gross tons plain bearings.



**Left**—Jeffrey 27-ton Eight-Wheel Trolley Locomotive. Drawbar pull (level)—13,500 lbs. Haulage capacity—675 gross tons with roller bearing cars; 450 gross tons plain bearings.

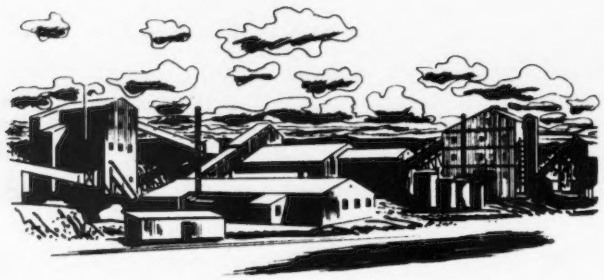
**THE JEFFREY LINE INCLUDES:**

Trolley Locomotives
Storage Battery Locomotives and Trammers
Combination Storage Battery and Trolley Types

**JEFFREY ALSO MANUFACTURES:**

Conveyors • Grizzly Feeders • Bucket Elevators • Fans • Chains
Shuttle Cars • Pulverizers • Magnetic Separators • Crushers

*More Information on Request*

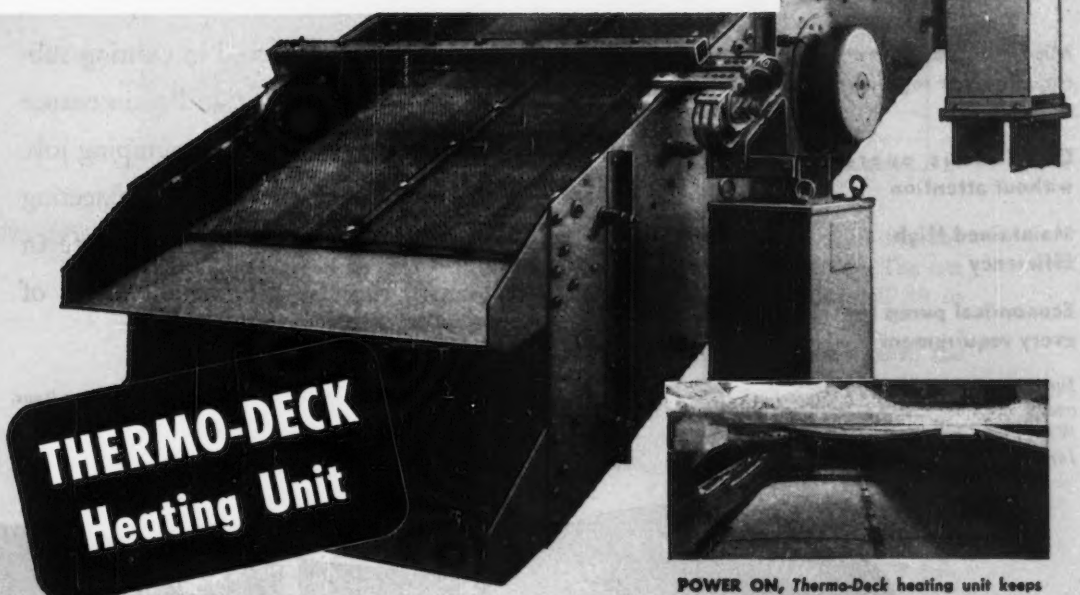


**IF IT'S MINED, PROCESSED OR MOVED**
***. . .IT'S A JOB FOR JEFFREY!***

**THE JEFFREY MANUFACTURING CO.**
ESTABLISHED 1877
**Columbus 16, Ohio**
***sales offices and distributors in principal cities***
**PLANTS IN CANADA, ENGLAND, SOUTH AFRICA**

# Stops Blinding

## Increases Capacity — Cuts Screening Costs






**POWER ON,** *Thermo-Deck* heating unit keeps screen cloth clear on vibrating screen handling fine, moist material.

**POWER OFF,** troublesome blinding occurs. This view shows same screen as above, with *Thermo-Deck* unit shut off.

**You can screen** fine, moist material *continuously* with a *Thermo-Deck* heating unit. No down time required to clear fine or medium mesh screen cloth!

Heated screen cloth remains open . . . you get *more* tonnage through the screen and better separation.

Operating records prove that heated wire cloth screens last up to three times longer than non-heated cloth, because they do not have to be pounded free of blinded material. For the same reason, you save man-hours too. These lower costs increase your profits.

The *Thermo-Deck* unit can be applied to Allis-Chalmers screens in the field. See your nearby Allis-Chalmers representative for complete details. Or write Allis-Chalmers, Milwaukee 1, Wis., for Bulletin 07B7812.

A-4272

### For Intermittent Feed... ADD A *STA-KLEEN* DECK

If feed is intermittent, fine material may bake on the wire cloth during interruptions in feed. Heat which ordinarily is absorbed by moist material increases the temperature of the wire cloth sufficiently to cause any fine material to bake on. The addition of a *Sta-Kleen* deck effectively prevents this. Bouncing rubber balls between the screen cloth and a ball retaining deck clear the cloth of baked-on particles.

# ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Thermo-Deck and Sta-Kleen are Allis-Chalmers trademarks.

# WILFLEY PUMPS

## Reduce Pumping Costs...Increase Production

**Minimum downtime required for replacement of parts**

**Continuous operation without attention**

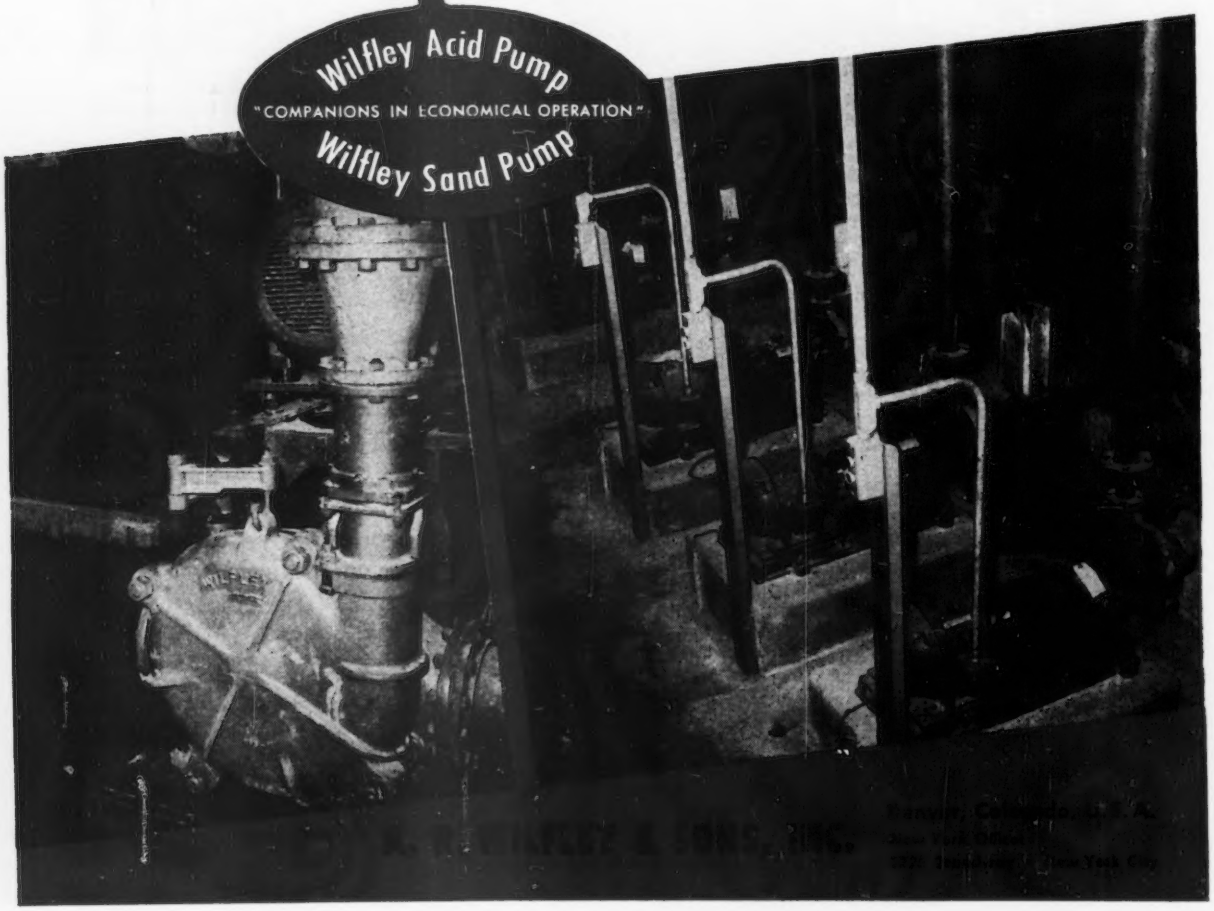
**Maintained High Efficiency**

**Economical pump for every requirement**

*Individual engineering on every application. Write, wire or phone for complete details.*

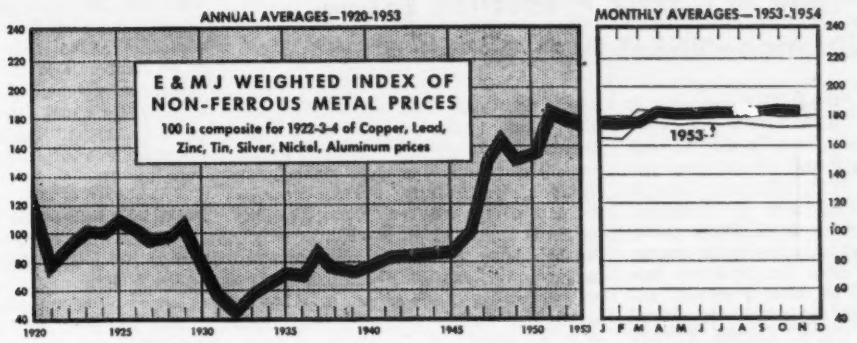
Wilfley's remarkable success-record in creating substantial dollar savings in power and maintenance means low-cost production on every pumping job. This cost-saving efficiency is born of engineering "know-how" plus many years of experience in keeping pace with the changing requirements of modern industry.

**Shown here are typical Wilfley installations. Rubber lining, alloy irons, plastics and stainless steel are some of the materials used in Wilfley Sand Pumps and Acid Pumps to provide maximum pumping efficiency.**



# E&MJ OUTLOOK

## PRICES


ANNUAL AVERAGES—1920-1953
E & M J WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is composite for 1922-3-4 of Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum prices
MONTHLY AVERAGES—1953-1954
1953
1954
J F M A M J J A S O N D

## MARKETS

**The E&MJ index** of nonferrous metal prices hardly changed in the last month. Lead and nickel averages were up a little, but tin was lower. The net result was a slight fall in the index to 187.44 for November, from 187.50 in October.

**London copper was easier** and as the scarcity in nearby metal ends, the prospects of establishing a price abroad that matches the U.S. selling basis are good. The outlook favors a firm 30c market for the early months of 1955.

**Nickel, which was raised 4½c to 64½c a pound, could have been moved** up to a much higher level except for the far-sighted sales policy of leading producer. Demands remain heavy.

**Titanium sponge was lowered in price** by DuPont for the second time this year. The price trend will be downward for years to come.

●

## LABOR

**Mine, Mill hits politics harder** after an election than before it. The reason is the support of a Red-tagged union doesn't help a candidate much before election, but working on him may influence legislation once he's in.

**Expect an all-out drive** to defend Maurice Travis from the Federal indictment on the Communist charge. MMSW has no replacement for him.

●

## AT HOME

**The outlook for 1955** is getting better and better, for industry as a whole, that is. Industrial activity, gross national product, and personal income, all seem likely to rise in 1955.

**How to get rid of stockpiling** without serious injury may be 1955's big problem for lead and zinc. Nobody seems to want it, but nobody can see any painless way to stop it. It will probably continue right through 1955.

**Cleveland-Cliffs' new Humboldt plant** (Michigan jasper flotation) runs way beyond rated capacity each month. It turned out 25,000 tons of high grade concentrate in October; it's rated at about 250,000 tons annually.

**Look for an announcement soon** as to who the contractor will be for the new uranium mill to be located in the Edgemont, S.D. area.

●

## ABROAD

**Estimates place** the new iron orebody found by Canadian Javelin in Newfoundland at a billion tons (see news pages this issue), but it will have to be milled to bring it up to grade.

**If venture money can be induced** to bring Argentina's oil fields into production, the country could slash the current $200-million oil import bill to the benefit of Argentina and those trying to do business down there. Floyd Odlum, president of Atlas Corp., is investigating these possibilities, with a view to producing oil, building pipelines, and producing atomic energy in partnership with Argentine industrialists.

# MARKETS—Trends and Prices

## Upward Trend in Copper Production Easing Supply Situation—Nickel Price Raised 4½c

**CONVINCED THAT THE** recovery in business in the fourth quarter will prove to be more than a flash in the pan and that the recovery will extend into the first quarter of 1955, fabricators bought metals more freely with no particular regard to the price level. With minor exceptions, prices remained quite strong. Outstanding in price developments was a rise in nickel of 4½c a pound, announced late in November by International Nickel Co. of Canada. Copper prices outside of the U.S. again fluctuated over a wide range, yet the domestic market continued to hold to the 30c basis with no indication of a change. DuPont reduced its selling basis for titanium sponge to $4.50 a pound on the top grade, effective Dec. 1.

**Steel production** continued to recover and operations in the U.S. were scheduled at slightly above 80% of capacity as November ended. The low for the year was around 60% of capacity recorded in the middle of July. The recovery in steel has imparted an improved tone to the market for virtually all products consumed in that key industry. Demand for manganese and iron ores has picked up and steadied prices. From present indications it looks as if 1955 prices on Lake Superior iron ores will be advanced to offset higher costs.

**The E&MJ index** of nonferrous metal prices hardly changed. Monthly averages for lead and nickel were higher, but tin eased. The index declined from 187.50 in October to 187.44 in November.

**Nickel for export** from Canada to the United States was advanced to 64½c (U.S.) a pound, Port Colborne, Ont., effective Nov. 24. The price includes the 1¼c U.S. import duty. The corresponding price of nickel in Canada at current exchange rates was advanced to 61.4c, Canadian currency.

In announcing the price changes, International Nickel stated: "Notwithstanding the company's constant improvement of its production methods through the development and installation of new facilities and more efficient methods of mining, refining and processing, production costs have continued to increase over the past several years. The price changes are intended to assist in offsetting these higher costs and at the same time provide schedules of prices which will not unduly impair the development of markets for nickel and nickel-containing products." Demand for nickel continues in excess of the available supply.

**Copper production** at the mines is increasing. The supply of refined metal, which necessarily lags behind mine output, should again meet the normal demands of industry after the turn of the year. This points to a more stable price situation, particularly in the foreign division of the market. The quotations on the London Metal Exchange, which moved above £280 per long ton for cash copper early in November, settled on the last day of the month at £265½ asked. The three-months' position closed at £257 asked.

The copper statistics for October (see page 110) revealed that foreign and domestic producers reporting to Copper Institute had a combined output of 208,177 tons of crude copper, excluding scrap, which compares with the low of last August of 175,481 tons. This recovery in production, which is expected to continue unless fresh complications come into the picture, has materially eased the tension among consumers. The scare buying of recent months resulted in sales of foreign copper at 35c a pound and even higher. The sensitive market for scrap copper showed signs of easing on strong indications that the squeeze in copper is drawing to a close.

The Office of Defense Mobilization has made 42,295 tons of copper available to U.S. fabricators to relieve the shortage resulting from recent strikes.

**Lead sold in good volume** despite the fact that some consumers thought the market might not hold at 15c a pound for long. The sustaining factor was a fairly strong foreign market and continued good demand here for lead products. Battery business picked up on increased activity at automobile plants. With the Government absorbing surplus lead for the stockpile, the favorable statistics of the industry also supported the price structure.

**Zinc production** at U.S. smelters has increased in recent months, following the resumption of operations at struck plants. With fairly large tonnages moving into the stockpile, the statistics continued to improve. Figures for October placed stocks in the hands of smelters in this country at the end of the month at 152,137 tons, against 175,505 tons a month previous and 193,252 tons on Aug. 31. Mine operators have been disappointed over the modest rise that has taken place in the price of zinc since the new stockpiling program got underway. Otto Herres, chairman of the National Lead and Zinc Committee, after a meeting of the group in New York late in November, said his organization had agreed to recommend that its members urge Senators and Congressmen to press either for higher lead and zinc tariffs or for some form of excise taxes to help reduce imports.

**Quicksilver prices** have eased. Consumers have been buying sparingly and production is being stimulated everywhere by record high prices. The trade looks for an improved supply situation in the first quarter and generally lower prices. European producers have not been pressing metal on an unwilling market, pending developments in reference to probable demands for next year. Mexican metal was available at concessions.

**Titanium metal sponge** was reduced in price by DuPont 22c a pound on the .3% iron grade and 46c on the .5% grade, effective Dec. 1, 1954.

**Platinum was unsettled** on offerings of

### CORRECTION

The *E&MJ* average prices that appeared on this page in the November issue were those for October and not September as indicated in the headline.

### Average Prices for November (E&MJ Quotations)

| | |
|---|---|
| **Copper:** | |
| Electrolytic, domestic, refinery | 29.700 |
| Electrolytic, export, refinery | 31.259 |
| **Lead:** | |
| Common, New York | 15.000 |
| Common, St. Louis | 14.800 |
| **Silver and sterling exchange:** | |
| Silver, New York, per oz. | 85.250 |
| Silver, London, pence per oz. | 74.313 |
| Sterling Exchange, "Checks" | 279.434 |
| **Zinc:** | |
| Prime Western, East St. Louis | 11.500 |
| Prime Western, delivered (g) | 12.000 |
| **Tin:** | |
| New York Straits | 91.109 |
| New York, 99% min. (e) | 90.109 |
| **Gold,** per oz. U.S. price | $35.000 |
| **Quicksilver,** per flask | $320.333 |
| **Antimony** (E&MJ) (d) | 31.970 |
| **Antimony,** bulk, Laredo | 28.500 |
| **Antimony,** in cases, Laredo | 29.000 |
| **Platinum** refined, per oz. | $77.667 |
| **Cadmium** (a) | 170.000 |
| **Cadmium** (b) | 170.000 |
| **Cadmium** (c) | 170.000 |
| **Aluminum,** 99% plus ingot. | 22.200 |
| **Magnesium,** ingot | 27.000 |
| **Nickel** (f) | 60.938 |

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

*Markets Continued on Page 110*

scattered lots by "outside" interests at lower prices. Refined metal sold down to $77, and byproduct platinum brought even less.

**Aluminum production** in the U.S. rose to 125,090 tons in October, raising total output for the ten months of the year to 1,212,278 tons. Output for all of 1953 was estimated by the Bureau of Mines at 1,252,013 tons.

**Manganese ore** was firmer as the month ended, reflecting improved consumption by steel mills and higher ocean freight rates. Indian ore of good quality, basis 48% Mn, was quotable at 77c per long ton unit. The recent low was 70c.

## "Free" Gold Market

The volume of business transacted in "free" gold increased during November by about 7%. Demand was fairly active. Prices named for gold coins averaged slightly lower, compared with October. Bar gold remained steady. There were no Russian gold sales during the month. Pick's World Currency Report quotes on "free" gold, per fine oz, as follows:

| | COINS | | BARS (12.5 kg) | |
|---|---|---|---|---|
| | Oct. 29 | Nov. 30 | Oct. 29 | Nov. 30 |
| NEW YORK, transit | ..... | ..... | $35.10 | $35.10 |
| MANILA | $41.00 | $40.75 | 38.25 | 38.00 |
| HONG KONG | 40.75 | 40.25 | 38.25 | 37.75 |
| BOMBAY | 48.75 | 48.50 | 48.25 | 47.50 |
| TANGIER | 40.75 | 40.45 | 35.05 | 35.05 |
| BEYROUTH | 41.50 | 41.15 | 35.25 | 35.25 |
| PARIS | 40.60 | 39.95 | 35.75 | 35.60 |
| BUENOS AIRES | 41.00 | 41.35 | 38.00 | 39.00 |

Note: All prices are computed at the free or black market value of the U. S. dollar in the local markets

## Major Metals

### U. S. DAILY AND AVERAGE PRICES

| Nov. 1954 | Electrolytic Copper (a) Domestic | (b) Export | Straits Tin New York | Lead New York | Lead St. Louis | Zinc Delivered (f) | Zinc East St. Louis |
|---|---|---|---|---|---|---|---|
| 1 | 29.700 | 30.150 | 92.250 | 15.000 | 14.800 | 12.000 | 11.500 |
| 2 | Holiday | 30.850 | Holiday | Holiday | Holiday | Holiday | Holiday |
| 3 | 29.700 | 30.875 | 92.125 | 15.000 | 14.800 | 12.000 | 11.500 |
| 4 | 29.700 | 31.225 | 91.625 | 15.000 | 14.800 | 12.000 | 11.500 |
| 5 | 29.700 | 30.775 | 91.500 | 15.000 | 14.800 | 12.000 | 11.500 |
| 6 | No Market | 30.775 | 91.500 | 15.000 | 14.800 | 12.000 | 11.500 |
| 8 | 29.700 | 31.600 | 91.250 | 15.000 | 14.800 | 12.000 | 11.500 |
| 9 | 29.700 | 30.550 | 90.625 | 15.000 | 14.800 | 12.000 | 11.500 |
| 10 | 29.700 | 30.800 | 89.875 | 15.000 | 14.800 | 12.000 | 11.500 |
| 11 | 29.700 | 30.750 | 90.625 | 15.000 | 14.800 | 12.000 | 11.500 |
| 12 | 29.700 | 30.250 | 90.875 | 15.000 | 14.800 | 12.000 | 11.500 |
| 13 | No Market | 30.925 | 90.875 | 15.000 | 14.800 | 12.000 | 11.500 |
| 15 | 29.700 | 33.375 | 91.375 | 15.000 | 14.800 | 12.000 | 11.500 |
| 16 | 29.700 | 32.000 | 91.500 | 15.000 | 14.800 | 12.000 | 11.500 |
| 17 | 29.700 | 31.700 | 92.250 | 15.000 | 14.800 | 12.000 | 11.500 |
| 18 | 29.700 | 31.225 | 91.625 | 15.000 | 14.800 | 12.000 | 11.500 |
| 19 | 29.700 | 31.375 | 90.875 | 15.000 | 14.800 | 12.000 | 11.500 |
| 20 | No Market | 31.775 | 90.875 | 15.000 | 14.800 | 12.000 | 11.500 |
| 22 | 29.700 | 32.375 | 90.750 | 15.000 | 14.800 | 12.000 | 11.500 |
| 23 | 29.700 | 31.525 | 91.000 | 15.000 | 14.800 | 12.000 | 11.500 |
| 24 | 29.700 | 31.775 | 90.875 | 15.000 | 14.800 | 12.000 | 11.500 |
| 25 | Holiday | 32.200 | Holiday | Holiday | Holiday | Holiday | Holiday |
| 26 | 29.700 | 31.250 | 90.750 | 15.000 | 14.800 | 12.000 | 11.500 |
| 27 | No Market | 30.900 | 90.750 | 15.000 | 14.800 | 12.000 | 11.500 |
| 29 | 29.700 | 31.075 | 90.625 | 15.000 | 14.800 | 12.000 | 11.500 |
| 30 | 29.700 | 30.650 | 90.250 | 15.000 | 14.800 | 12.000 | 11.500 |
| **AVERAGES FOR MONTH** | | | | | | | |
| Nov. | 29.700 | 31.259 | 91.109 | 15.000 | 14.800 | 12.000 | 11.500 |
| **AVERAGES FOR WEEK** | | | | | | | |
| Nov. | | | | | | | |
| 3 | 29.700 | 32.033 | 92.225 | 15.000 | 14.800 | 12.000 | 11.500 |
| 10 | 29.700 | 30.954 | 91.063 | 15.000 | 14.800 | 12.000 | 11.500 |
| 17 | 29.700 | 31.500 | 91.250 | 15.000 | 14.800 | 12.000 | 11.500 |
| 24 | 29.700 | 31.675 | 91.000 | 15.000 | 14.800 | 12.000 | 11.500 |
| **CALENDAR WEEK AVERAGES** | | | | | | | |
| Nov. | | | | | | | |
| 6 | 29.700 | 30.775 | 91.800 | 15.000 | 14.800 | 12.000 | 11.500 |
| 13 | 29.700 | 30.813 | 90.688 | 15.000 | 14.800 | 12.000 | 11.500 |
| 20 | 29.700 | 31.908 | 91.417 | 15.000 | 14.800 | 12.000 | 11.500 |
| 27 | 29.700 | 31.671 | 90.825 | 15.000 | 14.800 | 12.000 | 11.500 |

## Silver, Gold and Sterling

### DAILY AND AVERAGE PRICES

| Nov. 1954 | Sterling Exchange "Checks" | Silver (c) New York | Silver London | Gold London | Gold (d) United States |
|---|---|---|---|---|---|
| 1 | 280.0000 | 85.250 | 74.375d. | 250s. 7 d. | $35.00 |
| 2 | Holiday | Holiday | 74.375d. | 250s. 7½d. | Holiday |
| 3 | 280.0000 | 85.250 | 74.375d. | 250s. 7½d. | 35.00 |
| 4 | 279.8750 | 85.250 | 74.375d. | 250s. 7d. | 35.00 |
| 5 | 279.8125 | 85.250 | 74.375d. | 250s. 7½d. | 35.00 |
| 6 | (e) | (e) | (e) | (e) | 35.00 |
| 8 | 279.5625 | 85.250 | 74.375d. | 250s. 9½d. | 35.00 |
| 9 | 279.6250 | 85.250 | 74.375d. | 250s. 10d. | 35.00 |
| 10 | 279.8125 | 85.250 | 74.375d. | 250s. 6d. | 35.00 |
| 11 | Holiday | Holiday | 74.375d. | 250s. 6½d. | Holiday |
| 12 | 279.7500 | 85.250 | 74.375d. | 250s. 6½d. | 35.00 |
| 13 | (e) | (e) | (e) | (e) | 35.00 |
| 15 | 279.6875 | 85.250 | 74.250d. | 250s. 8d. | 35.00 |
| 16 | 279.5625 | 85.250 | 74.250d. | 250s. 8½d. | 35.00 |
| 17 | 279.5000 | 85.250 | 74.250d. | 250s. 9½d. | 35.00 |
| 18 | 279.3125 | 85.250 | 74.250d. | 250s. 10½d. | 35.00 |
| 19 | 279.2500 | 85.250 | 74.250d. | 251s. 1d. | 35.00 |
| 20 | (e) | (e) | (e) | (e) | 35.00 |
| 22 | 279.1875 | 85.250 | 74.250d. | 251s. 1d. | 35.00 |
| 23 | 279.0625 | 85.250 | 74.250d. | 251s. 1½d. | 35.00 |
| 24 | 279.0000 | 85.250 | 74.250d. | 251s. 3½d. | 35.00 |
| 25 | Holiday | Holiday | 74.250d. | 251s. 5d. | Holiday |
| 26 | 278.8750 | 85.250 | 74.375d. | 251s. 5d. | 35.00 |
| 27 | (e) | (e) | (e) | (e) | 35.00 |
| 29 | 278.8125 | 85.250 | 74.250d. | 251s. 4d. | 35.00 |
| 30 | 278.5625 | 85.250 | 74.250d. | 251s. 5½d. | 35.00 |
| **AVERAGES FOR MONTH** | | | | | |
| Nov. | 279.434 | 85.250 | 74.313 | — | 35.00 |
| **AVERAGES FOR WEEK** | | | | | |
| Nov. | | | | | |
| 3 | 279.906 | 85.250 | — | — | — |
| 10 | 279.738 | 85.250 | — | — | — |
| 17 | 279.625 | 85.250 | — | — | — |
| 24 | 279.163 | 85.250 | — | — | — |

Calendar Week Averages, New York Silver: Nov. 6th, 85.250; 13th, 85.250; 20th, 85.250; 27th, 85.250.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our "export" quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.50c.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually, one quarter-cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

# Behind the By-Lines...

G. P. Lutjen

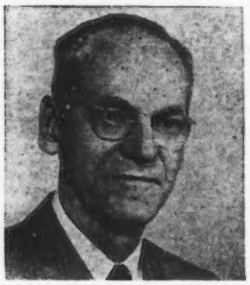
**This being the season when the Four-Way Cold Tablet** enjoys such a vogue, we thought we'd counter with a couple of three-way capsules of our own. The first is "Three-Way Geophysical Method Points Up Huge Pyrite Deposit" (Thought that "three-way" spiel was a gag, didn't you?), starting on p 84. The three ways in this case are spontaneous polarization, resistivity and seismic, and the story is how they teamed up in Japan.

The second item is "How a Three-Product Cyclone Helps Two-Product Separation," starting on p 95. E. C. Herkenhoff is the author, which is about as nice a thing as can be said for any article.

**When a miners' union sends a New Year's greeting** to a mining company expressing "our sincere appreciation of the perfect understanding and firm relations which exist between our Union and the Company," we think we have a vital story for our readers. So vital, in fact, that Managing Editor Al Knoerr made a 1,000-mi side trip up the Andes to get it; for it was at Compania Minera Aguilar in Argentine that the story was born. The entire formula which led to the establishment of such exemplary labor relations by VP Don McGilvra and Superintendent Wing Lew and their capable staff is laid out beginning on p 72. Basic ingredients of the formula are common sense, courage and hard work, and any practical mining man is the best judge of how handsomely the formula has paid off for both company and employees.

**In addition to Japan and Argentina,** we have another overseas call this month—Peru. If you have a few extra shekels and are mining-minded, Peru deserves some consideration. At least that's the conclusion we came to after reading Charles Will Wright's excellent summary of Peru's mining code and what it does to encourage foreign investment there. The title is "What Chance Has Foreign Capital In Peru?" and it begins on p 82.

We offered to write a sequel entitled "What Chance Has Foreign Capital in Red China?" but there is some sort of rule against feature articles containing only one word. We got the idea for a one-word article from one of our associates who came around with an attractive folder entitled "How to Win at Golf." Inside it contained just one word—"Cheat!"



**The provocative "Remarkable Case of the Copperhill Ball Mill"** (*E&MJ*, June 1953) is still having its reverberations and each echo is shedding more light on the intricacies of grinding. (A statement which shows that we can mix metaphors with the best of them.) The latest data comes from Dean A. W. Fahrenwald of the School of Mines at the University of Idaho, at Moscow, Idaho. Dean Fahrenwald (left) assigned one of his students, Harlow Oberbillig, to duplicate the grinding conditions of the Copperhill mill in a 12x12-in. mill in the laboratory. The result is some awfully interesting data, all of which is packed into p 79.

Nor is this the last that you are going to hear on the provocative question of grinding theory and practice. In our Guidebook Issue coming out in March you will find an article which will stir up debate like nothing else in recent years. Our best advice is to stand by with slide rule, brass knuckles and an open mind.

**For the Aesop aficionados** of long standing and, stories with Morals in general we are pleased to pass along the following from the Heil Co.'s *Sales Booster*. Perhaps its message will find application in *your* daily life.

"Once upon a time an African native king learned that anthropologists were heading his way, bent on carrying off his cherished golden throne.

"The wise king elected to hide the throne in the rafters of his hut, and retired, smugly content that his treasure would not be discovered. Unfortunately the throne crashed from its moorings and killed the ruler in his bed below.

**"Moral:** People who live in grass houses shouldn't stow thrones."

**Reaction** to last month's selection of music for mining men was surprisingly strong. The virulence of some of the complaints would have sent a less sensitive man scurrying to his psychiatrist. There were some people, however, that took it upon themselves to supply what they considered serious omissions in our list. A Wisconsin man suggested "Can't You Hear Me Calling, Calamine." A fugitive from lower Basin St. supplied "Stoping at the Savoy." And a misguided metallurgist submitted "I'll C u in My Dreams."

On the whole, we'd rather have the complaints.

**Our Christmas plum,** amigos, was supplied by Frank Ayer who gives credit for this opus to "somebody down in Chile."

'Tis the night before Christmas, and all through the casa,
Not a creature is stirring, ¡caramba! ¿Que pasa?
The stockings are hung con mucho cuidado,
In hopes that St. Nicholas will feel obligado,
To leave a few cosas aquí and allí,
For Chico y Chica (y something for me).

Los niños are snuggled all safe in their camas,
Some in vestidos and some in pajamas.
Their little cabezas are full of good things,
They're all esperando que Santa will bring.

Pues Santa está at the local cantinas,
Tomando cerveza y double martinis.
Mamá is sitting beside the ventana,
Shining her rolling pin para mañana.

When Santa returns sigzaqueando,
Lit like a Christmas tree, loudly cantando,
Mamá will send him to bed con a right,
Merry Christmas a todos, y a todos good night!

ENGINEERING AND MINING JOURNAL

DECEMBER 1954

# Mining and Its Friends

THE MINING INDUSTRY, like everybody else, enjoys having friends. And in a world as complex as today's we all need friends more than ever. Mining faces an era of great challenge . . . requiring not only top-grade geologists, engineers, mill men, executives but also a sympathetic government, labor force and public.

We've made a lot of friends by *being* friendly, and we'll make a lot more in the same fashion. Not in a back-slapping, hail-fellow manner, but by constant effort toward doing what is best, both for the industry and the people outside it, and by considering the source of our potential new friends in the fields of education, government, labor, and the general public.

Two recent news items and the lead article in this month's issue of *E&MJ* will give you an idea of the things being done.

In Utah, Miles P. Romney, manager of the Utah Mining Association, announced that that organization has shipped 1,139 mineral specimen boxes to teachers in and around Salt Lake City. Included was historical and economic information for each science teacher in secondary schools and sixth grade teachers in grammar schools aimed at assisting the pupils in learning "of the importance of mineral wealth to the state."

In Michigan, all Iron County mining companies cooperated in conducting a special mining institute for teachers. Educational talks were given and visits made to the mines. Men teachers went underground to observe actual operation.

In a number of AIME sections and sub-sections, members are giving frequent talks at high schools on the challenge of mining as a career, and its role in U. S. and world progress.

Each of these friendly gestures means effort on the part of the mining men involved, a "going out of the way" to make friends. And, in the light of current studies, there is every reason to think that this work will pay off in new recruits for the various branches of mining or, at least, a more sympathetic ear for mining's problems.

The lead article, starting on the following page, represents a landmark in the field of gaining friends. Management at Compania Minera Aguilar worked hard to win the present conditions at its mine. They found that their effort was duplicated by Sindicato Obrero Mina Aguilar, the union, and the final accomplishment was a well-run, mutually profitable and friendly operation.

There is still a great lack of understanding on the part of the general public of mining's problems and its contribution to the world's well-being. The public has yet to become fully aware of its dependence upon mining for the raw materials of peace and the sinews of national defense. Few people outside our industry realize that "every man-made thing you see and touch in everyday life depends on mining."

But the public is slowly learning; via articles on mining in general circulation magazines, by public interest in the current uranium boom, and by the increasing number of guided public tours offered by mining companies. Even the smallest mine can offer guided tours to its neighbors in nearby towns. It's a big help in improving local attitudes.

Wisdom and tact, as employed by leading members of the mining industry in the field of public relations, is paying off. It will continue to pay off as the effort devoted to it increases and mining enlists more friends for the exciting years ahead.

**WING LEW,** general superintendent, confers with Sr. Reinero Cruz, union president and D. M. Wade, Jr., assistant sup't.

**Message from the Union to Management of Aguilar, sent at the year end, 1953**

**"In the name of the Sindicato Obrero Mina Aguilar we wish to transmit to you our sincere appreciation of the perfect understanding and firm relations which exist between our Union and the Company. At the same time we ask you to transmit our cordial greetings to the heads of the different sections."**

**(Signed) Reinerio Cruz**
**President**

# Aguilar's Practical Formula

A. W. KNOERR
Managing Editor

WHEN A UNION sends cordial year-end greetings to management expressing "sincere appreciation of the perfect understanding and firm relations which exist between our Union and the Company" you can be sure that there is a good story in labor relations behind that event. This actually happened to the management of Cia Minera Aguilar last year, and it is *E&MJ's* privilege to report how this came about.

But before we examine Aguilar's outstanding labor and public relations program, here are a few background facts which will make it easier to appreciate what has been accomplished:

The Aguilar enterprise consists of an underground lead-zinc-silver mine in the northern Province of Jujuy, some 900 mi north 30 deg west of Buenos Aires, Argentina. The mine is situated on the eastern slope of the Andean range that divides Argentina and Chile, near where it continues over the Bolivian frontier. Elevation of the mine camp is 14,700 ft. Ore from the mine goes by 2900-meter aerial tram to another camp at mill elevation 13,100 ft. Concentrates from the 1,000-ton-capacity flotation mill are shipped by truck to the Tres Cruces rail station over a 47-km paved road built and maintained by Aguilar.

Population dependent upon the Aguilar enterprise during 1953 was as follows:

| | |
|---|---|
| Tres Cruces | 154 |
| Road | 41 |
| Mill | 1488 |
| Mine | 1639 |
| Total | 3,322 |

Comfortable housing units, ranging from one room for single men to three rooms plus bath and kitchen for married workmen, total 366 at the mine camp, and 315 at the mill camp.

Administrative offices are situated at the mill camp in addition to central repair shops, a 3000-kw diesel power plant, warehouses, flotation mill, schools, hospital, church, and a surprising number of social or sports clubs. The mine camp also has schools, stores, repair shops, and sports clubs in addition to usual mine plant installation.

Schools at the various units of Aguilar receive company assistance, chiefly in the form of supplies and equipment. Last year 575 children between ages 6 and 14 attended these schools. School expansion has enabled 84% of the children in this age group to attend as compared with only 72.6% in 1952.

In summary then, Aguilar is a sizable enterprise, supporting some 3,322 people who live in better-than-average comfort according to Argentina standards in the "puna" country (the provincial term for high plateau areas, which receive rain only about three months out of every twelve and for the rest of the year experience drought and cloudless skies).

Without the mine, the Aguilar property would be nothing more than a barren, windswept mountainside — without power, water, communications, or transportation. It would become a part of the hundreds of square miles of virtually unpopulated, undeveloped mountain country that surrounds it—inhabited only by the few who exist on the limited marginal grazing lands available, living in mud and stone huts.

But with the development of Aguilar came a source of living for thousands of people. Workmen, principally with agrarian background from the Altiplano of the Argentine and Bolivian Andes, found an opportunity to develop mechanical and other skills under the guidance of expert supervision from Europe and North and South America. Because of the isolated position of Aguilar, one fact that is often obscured in other more complex industrial areas stands out boldly—the welfare of the worker; and the comforts, necessities, and luxuries which he enjoys are directly dependent upon his own efforts and the cooperative production achievements of both labor and management.

"What is good for Aguilar is good for Argentina and for us" is the essence of a principle which union leadership endorses and is selling to its members. But it would be impossible for union officers to sell this idea if it

### Success due to "100% management backing."

DEVELOPMENT of the Aguilar property from the prospecting stage to the current productive stage took plenty of courage and hard work on the part of staff members of the St. Joseph Lead Co. and its Argentine associate Compania Minera Aguilar — especially because of the remote site of the enterprise which the Argentine press describes as being "on the roof of the World."

Among those who contributed much to the success of Aguilar is Don McGilvra who came to the property from Montana in 1937 and served as manager up to 1949 when higher executive duties as company vice president took him to Buenos Aires. But like all real mining men he is always happiest when he can leave his duties at headquarters for a 1,000-mile trip "up the hill" to see how the project is progressing.

The enlightened labor policies outlined in this article were greatly enhanced by the fact that Wing Lew, General Superintendent at the property, and his staff received "100% backing" from Don McGilvra and the officers of the St. Joseph Lead Co. in the States.

**DON McGILVRA,** formerly manager, now vice president of Cia. Minera Aguilar, Argentine associate of St. Joe.

# for Cordial Labor Relations

were not for the fairness and good faith with which the Aguilar management approaches labor matters.

The present state of harmony did not "just happen." There were times when excessive absenteeism (locally called "simulated sickness"), frequent grievance airings (often for petty reasons), low productivity, and abuse of equipment proved trying. But management did not consider these annoyances chronic, and therefore it set up the following 7-point long-range program to bring about better understanding and benefits for all parties concerned:

1. Just, fair, and considerate treatment; disciplinary policy should be as light as possible, with the object of correcting and not of punishing.
2. Consistent policy through the company.
3. Deal with the union with good will and in open-minded way. However, any arbitrary attitudes should be countered with firmness.
4. An efficient grievance procedure.
5. Encourage good living conditions, individually and collectively.
6. Encourage community participation in all projects.
7. Deal sympathetically and helpfully with the emergencies and tragedies of life.

Other objectives of the program include job security, fair wages, improved working conditions, and opportunities for advancement through training.

Management at Aguilar has not only charted the foregoing objectives —it works persistently to achieve designated aims. Much progress has been made, and the union recognizes the sincerity of this effort. So much so in fact, that the union itself has set down some objectives to make Aguilar a better place to work. And these objectives were formulated entirely and independently by the union authorities and members.

For example, here are the points of a notice prepared by the union for its members in 1953, aimed at increasing production and eliminating abuse of equipment:

"A. Observe strictly the number of working hours established by the company for the different sections of classes of work.

"B. Keep production at its highest level—commensurate with the workers possibilities.

"C. See to it that absenteeism without a justified reason is reduced as much as possible.

"D. The Committee of the S.O.M.A. (Sindicato Obrero Minera Aguilar) earnestly requests the cooperation of all of its members in combating absence from work through simulated illness.

"E. The 'delegado' (shop steward) in each section should keep a close check on absenteeism especially on Mondays and days following feast days.

"F. Avoid loss, breakage, etc., of tools and machines, etc.

"G. In the event that a fellow worker shows up under the effects of alcohol, the 'delegado' shall take steps to prevent him from working that day, and should the worker be suspended by the company, S.O.M.A. will not take any action in his favor."

The foregoing is an outstanding example of progressive union policy, but to top it off, just read the following

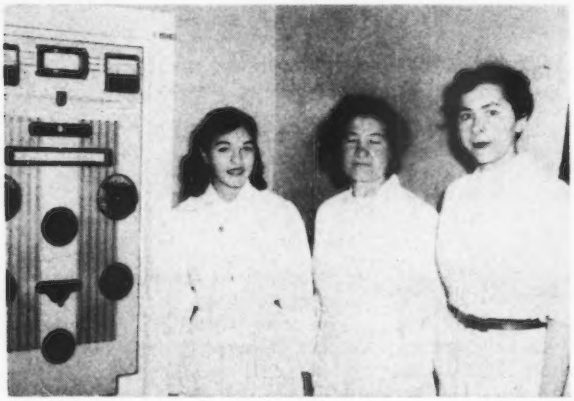
### Who's Who at Aguilar

**Wing Lew,** General Superintendent
**D. M. Wade,** Assistant General Superintendent*
**J. B. Magee,** Mine Superintendent*
**Robert Steele,** Assistant Mine Superintendent
**Ed Lea,** Chief Geologist*
**Jan Kurpiel,** Mechanical Superintendent
**Francisco Tirado,** Power Plant Superintendent
**Thomas R. Morton,** Mill Superintendent
**Guillermo Castillanos,** Accountant
**Ernest W. Myers,** Personnel Manager
**Kenneth Hough,** Warehouse Chief
**Gerald Spielman,** Store Manager
**Engelbert Muhr,** Electrical Superintendent

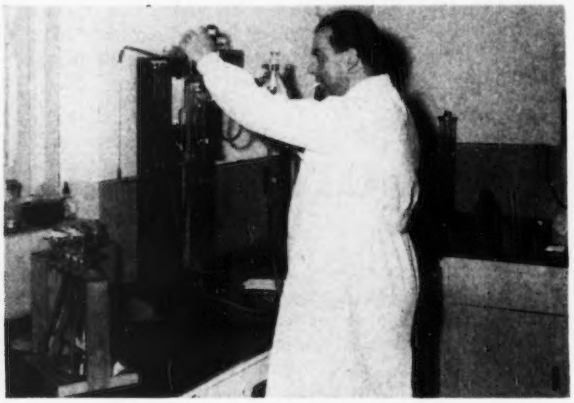
* Since the author's visit to Aguilar earlier this year, the following changes have been made: **D. M. Wade** has been placed in charge of a new Aguilar prospect in Argentina. **J. B. Magee** has become Assistant General Superintendent. **J. M. Girran** is Mine Superintendent. **Ed Lea** has been transferred to St. Joe operations outside of Argentina. **F. B. Whiting,** from St. Joe Missouri operations, is Chief Geologist.

**SPANISH SCHOOL** follows the Argentine normal course. The company contributes equipment, supplies, and funds.

**ENGLISH-SPANISH** school for staff children follows the Calvert system. Total enrollment at all schools is about 575.



**MODERN X-RAY** is exhibited by Alcina Savefra, technician, Maria A. Cadelego, visiting nurse, and Georgina de Ruiz.



**DR. DI NINO GOLA** investigates biological effects of high altitude at Aguilar laboratory of the University of Tucuman.

excerpts from S.O.M.A.'s 1953 resolutions on the control of alcoholic drinks:

"The sale of alcoholic drinks to employees and workmen is strictly forbidden on work days in clubs, hotels, etc., at the mill, mine and Tres Cruces . . . and S.O.M.A. will request that the sale of alcoholic beverages at stores at these places be also suspended on pay days" (Many a mine camp in the U. S. might do well to imitate the objectives of our South American neighbors to make sure that the fat pay check goes for betterment of the family welfare, and not down the drain.)

"On Sundays and Feast Days, alcoholic beverages will be served up until 11 pm, and the dance will terminate at 12 pm sharp, considering that the people have to go to work the next day.

"Steps will be taken to reduce the sale of alcoholic beverages to a reasonable level in the clubs."

Just as management at Aguilar insists on making its program an effective working program, so also does the union insist on results. If a worker shows up drunk, the "delegado" will actually take it upon himself to ask the section superintendent to order the man home and even suspend him from work for a few days more if necessary to make the disciplinary measure sink in.

## Wage Policy

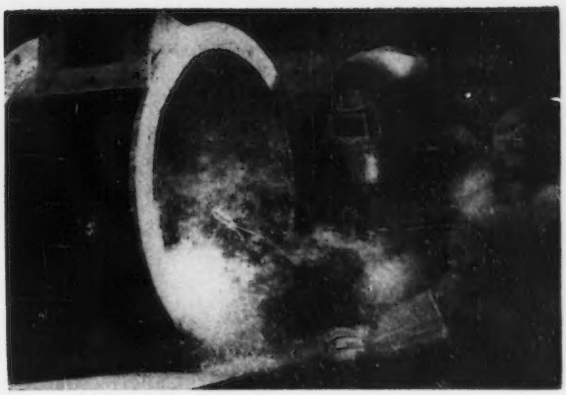
To encourage personal initiative and effort, promotions at Aguilar are based on the individual merit of the employee and are decided by the chiefs of sections (department foremen). Wage increases are made on the basis of merit and category; the latter being the principal factor taken into account in collective bargaining raises — the higher category workers who contribute more important work toward production receive larger increases. In the office employee class (all in the same category) a range of salary increase is negotiated with the union, and the chiefs of sections are given the authority to select 30% of their employees who will receive a larger increase. Union recognizes the fact that the employees who contribute more to the company deserve a higher remuneration.

Aguilar's wage scales are highest in the Province of JuJuy, but not so much higher than, say the sugar industry's, that they create an inflationary hazard. During past inflationary periods both labor and management have tempered their wage deliberations to comply with the request of the Government Labor Department to cooperate in stemming inflation.

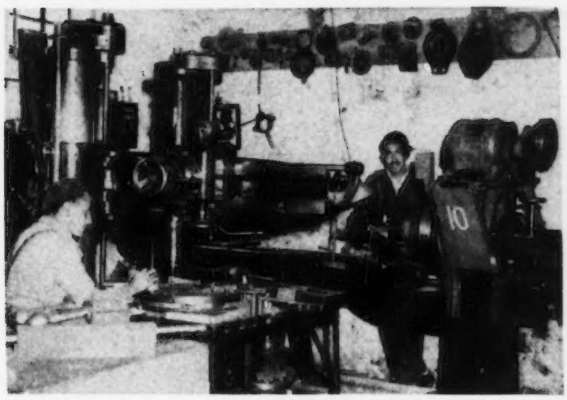
Indirect benefits amount to over 100% of payroll and (besides items mentioned elsewhere) include family allowances, pension fund contributions, year-end bonus (one month's salary), indemnities for accidents or natural death, group insurance, bonuses paid on voluntary withdrawal from the company with a good work record.

One of the most stimulating sights at Aguilar is the crew of skilled mechanical workers in the mill camp shops. Here you will see workmen raised in the agrarian atmosphere of the Bolivian Altiplano performing such intricate tasks as machining splined pistons of rock drills; operating high-speed grinders for rock drill cylinders; building vane stators for air motors;

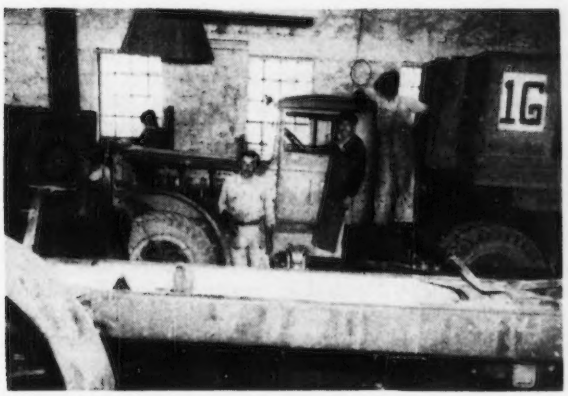
**EMPLOYEES,** raised in the agrarian atmosphere of the Bolivian Altiplano become excellent miners at Aguilar.



**THEY ARE ALSO TRAINED** to become excellent mechanics under skilled supervisors from Europe and the Americas.



**SHOPS WORKERS PROVED THEIR SKILL** during recent critical equipment shortage, when they turned out such intricate repair parts as splined pistons for rock drills, vane stators for air motors and overhauled diesels from the bedplate up.

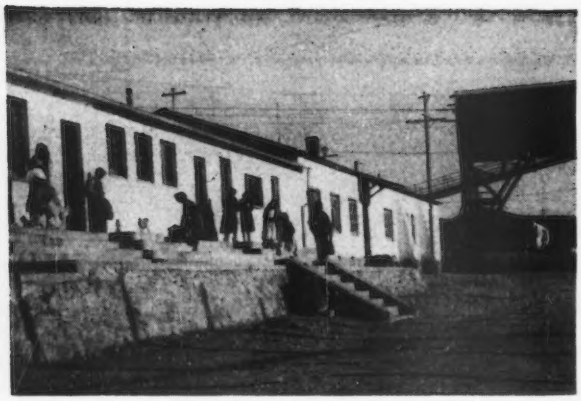


**THESE MECHANICS** started with frame and wheels, foreground, ending up with complete repair and assembly rear.

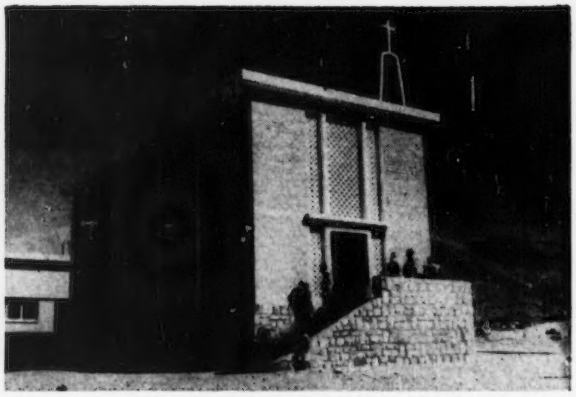
**AGUILAR IS DEPENDENT** upon this 3000-kw diesel-electric plant for power. Trained operators keep the engines spinning.

to say nothing of practically rebuilding a complete truck with only the wheels and frame to start with. These mechanical crews have actually dismantled and overhauled the large power-plant diesel engines from the bed-plate up, which includes making and reconditioning spare parts in the company shops.

Perhaps we may ask: "Why did Aguilar have to go to such extremes as to build such intricate parts as drill pistons, and rebuild trucks?" This was due to a very difficult period in recent years when national economic conditions did not permit the importation of machinery and parts. And while this situation is being constantly improved, Aguilar can take a considerable amount of pride in its record of having kept mine and mill going when many less ingenious or determined managements and staffs would have given up and "shut her down." The mine was literally operating for many months on just plain baling wire and courage, and on a day-to-day and hand-to-mouth basis. But now that brighter days are ahead, the value of the emergency period endured can be



**COMMUNITY STORES** provide workers at the various camps with the necessities of life at non-profit, break-even prices.



**CHURCH AT AGUILAR MILL CAMP** with unique modernistic features never fails to catch the eye of property guests.

**AGUILAR BOASTS 11 SOCIAL CLUBS** such as this, which provide sports and diversions for a balanced life.

**HOW DO THEY DO IT?** That's what visitors wonder when they see people running at top speed like this at 14,000 ft plus .

tallied up as follows: (1) the livelihood of thousands of dependent workers was uninterrupted; (2) many workers were enabled to develop mechanical skills which would have been dormant under less urgent conditions; and, (3) management was able to prove to its workers that determination and skilled guidance can save an enterprise in an emergency.

One thing that Aguilar scrupulously avoids is politics, and with that policy it has successfully demonstrated that it is what it aims to be: "A good corporate citizen, complying with both the letter and the spirit of the law." National policies are respected, and all workmen have complete freedom to observe their political beliefs. Representatives of the Government or of major political parties are always accorded a courteous reception at the mine property, allowed to see and learn what they want, and to speak to whom they please. In the words of Wing Lew—"Aguilar has nothing to hide."

Up to here, this article explains Aguilar's policies and objectives to achieve better living conditions for its people, and harmonious labor relations. It shows how the employees and their union have responded cooperatively to the benefit of all concerned.

Now let's look at some of the unusual community aspects of Aguilar which has contributed to a more comfortable and happier life for both staff members and employees (in addition to those previously mentioned):

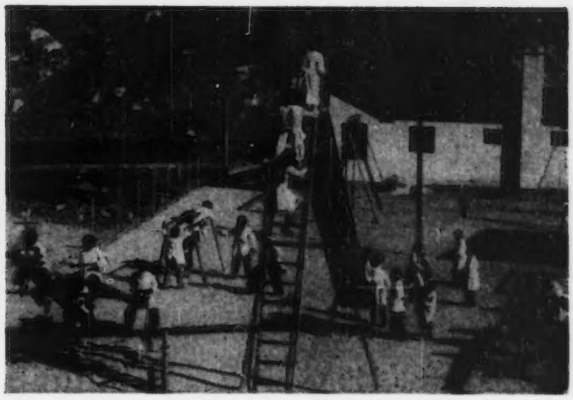
**1. Social clubs and playing fields.** Perhaps no mine in the world can boast as many social clubhouses (11), football fields (2), tennis courts (3), basketball courts (6), and Italian bowling alleys (3), for its size as Aguilar. Visitors are always baffled to see handball, tennis, or soccer players scamper around at high speed at an altitude that slows the average man down to a walk. Both staff and employees take full advantage of these sport opportunities.

The idea of building better-than-average recreation facilities at Aguilar is based on the sound concept that the healthy, active employee is the best employee. Both labor and management can point to Aguilar's recreation facilities with pride because management supplied the tools and materials—the employees did the work, after hours and on their own time. So the employees can truly say that the clubs are their own, to run as they please, and to maintain on a sound financial basis by modest dues levied against the members.

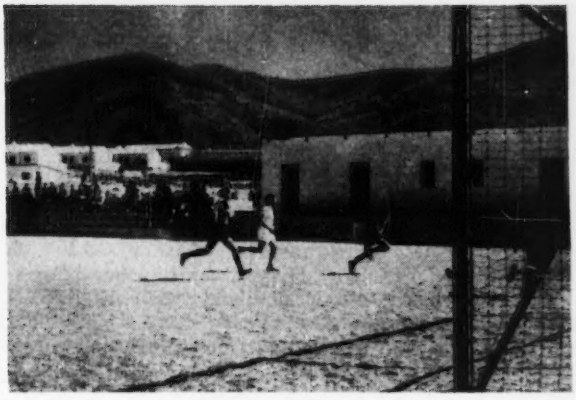
In addition, the whole camp enjoys movies once a week for free (double feature and newsreel). A playground, completed in 1953, is so modern that even the merry-go-round is equipped with ball bearings (see illustration). Play facilities for youngsters are so adequate at Aguilar that mothers are now complaining — It seems that "Junior" tarries too long on his trip to the town market for groceries.

**2. Hospital and medical care.** A modern hospital of 40 beds is headed by Dr. L. Cabezas who is assisted by a staff of nurses, a midwife, and trained X-ray technicians. Employees take full advantage of the company's free health and medical services as evinced by some 17,506 consultations, 1,597 physical examinations, 8,380 treatments, 19,925 injections, 299 X-ray examinations, and 367 hospitalized cases handled during 1953. An

**MILL CAMP MOPPETS ROMP** in front of one of the comfortable homes for staff members. Note alpine flower plots.



**THE PLAYGROUND** is a popular spot at the mill camp when youngsters are not in school or running errands.



**A FAST GAME OF SOCCER** kicked off at an altitude that will slow the average non-acclimated visitor to a snail's pace.

**AGGRESSIVE GIRLS' TEAM** tries for a basket at one of the many sport fields in the shadow of the aerial tramway.

effective Mother's Club aimed at raising hygienic standards was formed by Visiting Nurse Maria A. Cadelago, and X-ray technician Georgina Ruiz, and now adds much to the community health standards. To insure adequate nutrition of infants, free powdered milk is provided for all babies up to third birthday. The services of a dentist and oculist round out Aguilar's program to maintain a healthy community.

**3. Schools.** Some 575 children attend schools in the various camps, where company assistance is largely in the form of supplies, equipment, and scholarship funds. Staff members send their children to a Spanish-English school. The English section is conducted under the Calvert System, and the Spanish school follows the Argentine normal course. One look at the advanced examination questions, which the youngsters of 6 to 10 years have to answer in both Spanish and English, will convince any visitor that there is a distinct advantage to raising children out of reach of television and comic books. Of course, much of the success of this training depends upon the hard work which the parents put in, in addition to the teachers' efforts. A nonsectarian Sunday school is conducted by Mrs. Wade and Mrs. Lew.

Correspondence courses are provided for all persons who wish to acquire further knowledge of their job. Scholarships are granted to employees' children to enable them to get a secondary education outside Aguilar. Visiting nurses also conduct adult classes in reading and writing for persons who have not had the advantages of an education.

**4. Community store.** Aguilar runs a community store on a break-even basis which provides the necessities of life for the residents as cheaply as possible. When soaring prices forced the company to raise store prices some time ago, the union cooperated by investigating inflationary conditions, and explained the necessity of the price increases to its members.

In fact, in 1951, the union offered to pay the fare to JuJuy of any member who doubted the justification of price increases, and wanted to compare Aguilar prices with those paid elsewhere.

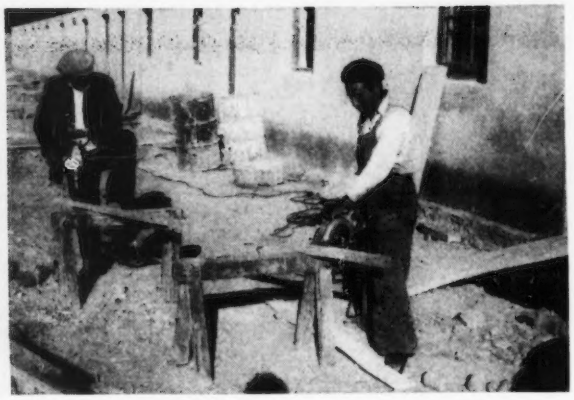
**5. Church.** Aguilar's attractive church (see illustration) was built with funds supplied by the Government of JuJuy. However, since funds were lacking to furnish the church, the company cooperated with a church committee to fit out the interior.

**6. Mutual Aid Fund.** Directly in line with the management aim to "deal sympathetically with the emergencies and tragedies of life," the company and the union worked out a Mutual Aid Fund, in which initial subscription is 20 pesos per member, and thereafter each employee contributes 2 pesos per month. The company deposits to the fund an amount equal to that collected from members.

Distribution of funds to deserving members is administered by a committee consisting of two men appointed by the union and two men from the company; one the company doctor.

**7. Savings plan.** In 1952, with the object of promoting thrift among the workmen, Aguilar offered to pay an extra month's salary in four three-monthly quotas to employees who made deposits of 50 pesos per month

**MODERN HOUSING DEVELOPMENT** completed at the mill camp. Note sport field and clubhouse in the foreground.



**BUILDERS** work with modern power saws and hand drills in the construction of a new housing group at the mill camp.

to their post office savings account. At the specific request of the union it was made one of the conditions that withdrawals of these amounts must not be made under 12 months.

**8. Housing.** House construction for workers is almost a continuing project at Aguilar, in which successive designs undergo constant improvement. Recent family units provide a private wall-enclosed patio, bath, kitchen, living room, and sleeping quarters. Mechanical tools such as power drills and circular hand saws speed the construction work.

**9. High-altitude research.** Effects of high altitude on human beings and animals are being studied in a research laboratory at Aguilar's mill camp under the direction of Dr. Di Nino Gola of the Instituto de Biologia de la Altura sponsored by the Government University of Tucuman. This is one of the three laboratories of this nature in the world, the others being in Switzerland and Peru. Aguilar provides the building for the laboratory, and accommodations for the staff, while equipment is furnished by the sponsoring university. Current work investigates such factors as respiration, diet, and blood analysis as affected by high altitudes at which the operations are located.

**10. Incentive promotion.** One of the problems which has had to be faced by the management of Aguilar is how to assist the population without destroying all personal incentive and initiative —a very real problem among workers whose background has not always furnished them with a desire for further progress. To guard against this the management has contributed to many welfare projects on a 50-50 basis, matching their contributions to the amount of self-help put in by the populace. In other cases (such as in construction of clubs and recreational facilities) the company has provided materials and the organizers have provided the necessary labor in providing outside activities.

## Good Public Relations

The foregoing laudatory appraisal of Aguilar's success in establishing sound relationships between the company and its employees, the community and the country, is echoed in glowing press stories written by reporters who visited Aguilar to see what had been accomplished in "the city in the clouds" as one reporter expressed it. Visitors, members of the press, delegates of unions, government officials, engineering students have all been accorded a polite reception during the past years with the invitation to look the place over, talk to whom they pleased, and formulate their own opinions.

Here are a few translated excerpts from articles written by reporters of the Argentine press who visited Aguilar:

**From a JuJuy journal, Dec. 6, 1953.** "Mina Aguilar, which is an industrial city erected on 'the roof of the world' presents a picture of tremendous activity. The powerhouse, with its powerful diesel engines, supplies light and power required by this large mining plant, makes possible the industrialization of the wealth which is buried in the Aguilar mountains. . . . Mina Aguilar has a well-equipped hospital, also schools, office buildings, houses for employees and workmen, and a fleet of automobile vehicles." . . . "The high standard of living is an outstanding characteristic in Mina Aguilar, and is enjoyed by all classes of workers (skilled and unskilled). The company provides free of charge comfortable dwellings for workers, employees and their families, also free medical care and hospitalization. Electricity, water and sanitary facilities are also supplied free of charge. Foodstuffs, meat, vegetables, bazaar articles, etc., are sold at the company's stores without a profit. . . .

"The provision of housing, medical care and hospitalization, as well as other efforts towards the advancement of education and social welfare of its workers, employees and their families, speak well for Compania Minera Aguilar."

**From Mineria Justicialista, June 1, 1953.** "There was perfect agreement among the various delegations which had come from the city of San Salvador de JuJuy to celebrate 'Semana de la Mineria Justicialista,' that a visit should be made to Mina Aguilar. . . . We must point out that we met with very agreeable surprises in Mina Aguilar. Indeed nobody would expect to find such an important town at 4,000 meters above sea level. . . . Space in this article does not permit giving a full description of all the interesting things we saw in Aguilar. We must, however, point out the hearty reception given us by the authorities of Compania Minera Aguilar, headed by Mr. Wing Lew. The workmen of Mina Aguilar, headed by Senor Maximo Cadelgo also gave us a hearty welcome. . . . As a matter of fact, not all of the 'delegados' expected to find in the northernmost part of Argentina such a remarkable progress in mining, because Mina Aguilar is unquestionably one of the foremost industries in this part of the country . . . which makes us proud to belong to this new era in the history of Argentina."

So speaks the Press of Argentina—a press which was cordially invited to see for itself what Aguilar does for its people and Argentina.

# Why A Smaller Ball Load Gives Better Milling Economy

A. W. FAHRENWALD
Dean, School of Mines,
University of Idaho,
Moscow, Idaho

ECONOMIC ADVANTAGES of a low ball load in the grinding mill are a result of less over-grinding, and show up in smaller ball consumption, less reagent consumption and increased recovery as well as the power savings normally expected from the smaller mill load.

This was the conclusion reached from experiments at the University of Idaho using a 12x12-in. ball mill in which were duplicated the grinding conditions of a large production unit at Copperhill, Tenn.

"The Remarkable Case of the Copperhill Ball Mill" was the subject of extensive discussion by various engineers in the June and September 1953 issues of *E&MJ*. The seemingly "remarkable" thing about this ball mill, that created all the interest, was that when the mill was switched from a 45% ball load to a 29% ball load a lot of things, all on the profit side of the ledger, happened. (See Table I.)

**Table I—Improvements in Mill Performance at Copperhill Due to Decreased Ball Load**

| | Now | Before |
|---|---|---|
| Ball load, tons | 35 | 55 |
| Ball load, % volume | 29% | 45% |
| Tonnage | 2250 | 2130 |
| Horsepower requirements | 370 | 490 |
| Ball consumption, lb/ton | 0.84 | 1.02 |
| Grind: sulphides—200 mesh | 65% | 62% |
| Grind: gangue—200 mesh | 35% | 40% |
| Tails: copper | 0.068% | 0.08% |
| Tails: sulphur | 2.5% | 4.0% |
| Sod. ethyl xanthate, lb/ton | .28 | .34 |

In my discussion of the "remarkable" performance of the mill (*E&MJ*, November 1953) I attributed the improvement which resulted from the switch from larger to smaller ball load, to: 1) the larger tonnage (2.95 tons) of ore in the small-ball-load mill; and in turn, 2) to the higher ratio of ore to balls in the ball mass under the condition of the smaller ball load.

Using a 12x12-in. ball mill, Harlow Oberbillig, a senior in my ore-dressing class, made a few grinding tests under conditions, with respect to ball load, mill load (pulp and balls), speed of rotation of the mill and pulp density, to simulate the Copperhill ball mill.

All grinding tests in this experiment were conducted in a pulp that had 60% solids (pulp density, 1.595). The speed of the 12x12-in. mill was 47 rpm, equal to 61.2% of the critical speed.

Ball charge for the 45% load weighed 106 lb and for the 29% load, 68.4 lb. The void space in the larger charge was determined by measuring the volume of water that would fill the voids. This was found to be 3590 ml. Proportionately, the 68.4-lb load had a void volume of 2320 ml. In addition, to achieve a ball and pulp load totaling 45% of the mill volume, it was necessary to add 3450 ml of pulp with the 29% ball load.

**Table II—Conditions of Experimental Grind**

| | | |
|---|---|---|
| Ball load—percent of mill volume | 29% | 45% |
| Weight of balls, lb. | 68 | 106 |
| Grams of feed, silica sand | 5770 | 3530 |
| Water, ml or grams | 3850 | 2370 |
| Speed of mill, percent critical | 61.2% | 61.2% |
| Power input, watts | 73 | 90 |

The conditions of the two grinds are shown on Table II and data in Table III.

It may be observed that the 45% grind made a product containing more surface units (45,287) per unit weight of charge than did the 29% grind (38,646). If these figures, however, be multiplied by the number of units of solids in the mill—3530 and 5770 respectively—the result is that the 45% mill produced (33.409x3.53) 118 surface kilograms and the 29% mill produced (26.77x57.7) 154 surface kg, a difference of (154-118) 36 surface kg in favor of the 29% mill.

Now if these figures be divided by the power input, 90 watts in the case of the 45% mill and 73 watts in the case of the 29% mill, the result is that the 65% mill makes (118 ÷ 90) 1.31 surface kg per watt unit of time and the 29% mill makes (154 ÷ 73) 2.10 surface kg per watt unit of time.

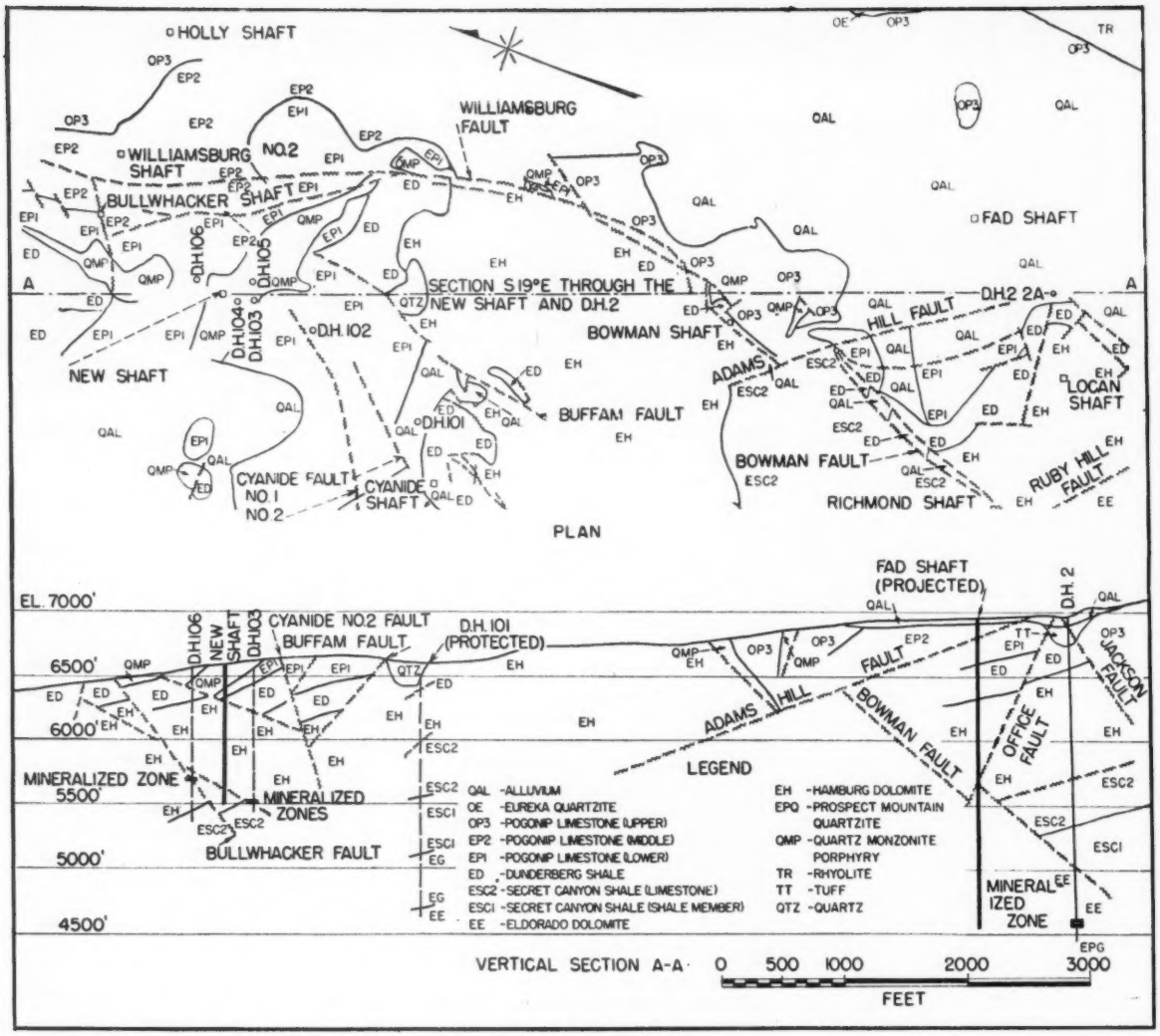
## Conclusions

What this experiment seems to prove, is, that "The Remarkable Case (performance) of the Copperhill Mill" is not to be attributed to: 1) the particular shape or size of the ball mill; or to 2) classification within the mill on account of the so-called larger pulp pool in the low-ball-load mill.

The experiment does not prove anything directly relative to 1) ball consumption, 2) reagent consumption, or 3) recovery resulting from the two grinds. It is obvious, however, that the economic advantages of the 29% ball load over the 45% ball load accrue as a result of less over-grinding in the case of the 29% ball load. This naturally would show up in less ball consumption, less reagent consumption and increased recovery. Two reasons for increased recovery are: 1) fewer difficult sub-sieve particles to cope with; and 2) higher flotation machine capacity owing to fewer particles to recover per unit weight of finished product—assuming mineral liberation is equally complete in the two grinds.

**Table III—Experimental Data**

| Sieve mesh | Surface units | Feed wt % | Feed surface | Ball Load 45% mill Wt % | 45% mill Surface | Ball Load 29% mill Wt % | 29% mill Surface | Units of new surface 45% mill | Units of new surface 29% mill |
|---|---|---|---|---|---|---|---|---|---|
| 28 | 45 | 14.4 | 647 | | | | | | |
| 35 | 64 | 22.8 | 1,460 | | | | | | |
| 48 | 90 | 18.3 | 1,650 | | | | | | |
| 65 | 128 | 16.2 | 2,060 | 0.5 | 64 | 1.8 | 231 | | |
| 100 | 181 | 19.6 | 3,550 | 2.5 | 453 | 11.8 | 2,140 | | |
| 150 | 256 | 6.2 | 1,590 | 6.6 | 1,690 | 16.8 | 4,300 | | |
| 200 | 362 | 2.4 | 870 | 21.2 | 7,680 | 24.5 | 8,875 | | |
| −200 | 512 | 0.1 | 51 | 69.2 | 35,400 | 45.1 | 23,100 | | |
| Total | | 100 | 11,878 | 100 | 45,287 | 100 | 38,646 | 33,409 | 26,768 |




**NEW OREBODIES** have been located in area around new shaft at left above, and to southwest of Fad shaft, above right.

## An E&MJ Special Report:

# Discovery Of New Orebody Revitalizes Eureka District

JOHN B. HUTTL, Associate Editor

DISCOVERY of lead-zinc-gold-silver ore of direct shipping grade at two properties currently active near Eureka, Nev., has put that irrepressible district back in the news.

Cons. Eureka Mining Co. is already shipping such ore from an orebody discovered recently in cross-cutting operations at its mine a short distance from the town of Eureka.

Eureka Corporation, Ltd. is sinking a four-compartment shaft in the Adams Hill section, a part of the leased Richmond-Eureka holdings, to explore and develop by lateral workings ore zones discovered by previous rotary drilling.

It's interesting that all ore zones found in the Adams Hill area occur in the lower Hamburg dolomite, a formation that has only recently been proved a host rock by the Eureka Corporation geological staff. The work done so far and what is ahead will be described in this article.

The Eureka district is an old one, mining dating back to 1866. It is also considered the birthplace of the lead-silver smelting industry in the United States.

Like all old mining camps, Eureka has had its booms and depressions. The first substantial revival after suspension of operations by U. S. Smelting, Refining & Mining Co. in 1910 occurred in 1937 when Eureka Corporation, Ltd. leased under a long-term agreement (expiring in 1985 with a 15-yr renewal privilege) the Ruby Hill properties from the Richmond-Eureka Mining Co., a subsidiary of U. S. Smelting. Soon rehabilitation work was

started, followed later by a diamond drilling campaign in the Locan shaft area to explore formations below those productive in the early days.

Subsequent discovery of ore in two holes advanced from the 900 level in the Locan shaft led to the erection of a surface plant 1400 ft north of the shaft as a preliminary to sinking the four-compartment Fad shaft. Full-scale sinking operations were started late in 1945, and the 2400-ft objective was reached early in 1948. During this period some difficulties incident to bad ground and water flows were encountered and overcome (*E&MJ*, December 1945 and December 1947).

It was while driving a long west crosscut from the 2250-ft level to the ore zone that the shaft was flooded by a heavy flow of water. To permit use of more and heavier pumps in the shaft, new power units were installed, and though the pumping rate reached the 10,000-gpm mark, the water level could not be held.

## What the Experts Said

Study of the problem by experts, including the Cementation Company, Ltd., London, England, and company engineers indicated that to draw the water level below 2250 ft, about 25,000 gpm will have to be pumped for a period of about 1 yr, the rate to be decreased thereafter to around 10,000 gpm for the life of the mine. Capital and operating layout for the method of grouting and pumping recommended by Cementation Co. to reach the known ore zones is estimated at $6,500,000.

Success of any future unwatering operation depends on development of an inexpensive source of electric power. Several projects are under study, requiring heavy capital expenditure.

In evaluating the various proposals, the management was confronted with the choice of going ahead with the power and unwatering program, or postponing it temporarily and centering activities in exploration around the Fad shaft and Adams Hill areas by rotary drilling. Previous studies by G. W. Mitchell, vice president and general manager, and the geological staff indicated that additional ore could be found in the Fad shaft deep zone and that new orebodies lay in the lower Hamburg dolomite in the Adams Hill area. In the end, choice fell on the proposed exploration campaign.

Accordingly, rotary drilling equipment was purchased, consisting of a Franks 137 drill unit with a tool string capacity of 150,000 lb or, with 3-in. drill rods, about 5000 ft and a Joy 300 oil well drill good for 2000 ft when using 3-in. drill pipe. Drilling began in 1952.

Drilling through non-mineralized formation was done with Hughes Tricone or Reed (2-gage cutters and 2 cones) bits. The bit used in core drilling was a Christensen diamond core bit (6½-in. outside diameter, taking 3½-in. cores), together with a 13-ft full-floating core barrel of like make. Core recoveries average 95% when taking 3 to 4 ft of core.

During the drilling campaign carried out in the Fad shaft zone from early 1952 to late 1953, holes 2, 3, and 2a high-value mineralization was cut between the 2334- and 2480-ft horizons. Values encountered in the upper zone (2334-2375½ ft) averaged $76.25 per ton in lead, zinc, gold, and silver, and in the lower zone (2414-2480 ft) $57.86. In April 1953 part of the drill equipment was moved to the Adams Hill area to check a previous geologic study.

The geology of the area currently under development is shown in detail in Fig. 1. Occurrence of the Hamburg, a receptive host rock, and large porphyry intrusives, probable sources of mineralization, almost in juxtaposition and the presence of mineralization in the outcrops of Hamburg and Pogonip adjacent to the intrusives led to the conclusions, several years ago, that the lower Hamburg should be explored.

Mineralization in the Hamburg occurs in hydrothermically silicified dolomite lying immediately under Dunderberg shale overlain in turn by Pogonip limestone.

In the Holly and Bullwhacker mines some mineralization in the Pogonip is found. Here also are found thick sills of quartz monzonite porphyry. The middle Pogonip limestone is sparsely mineralized, giving a good indication that it could be a potential ore maker. The Hamburg dolomite has also been found to be a good host rock in the property of Cons. Eureka Mining Co. and other mines in the Prospect Mountain Range.

## Where They Prospected

The plan evolved to prospect the Hamburg formation underlying both the Pogonip and quartz monzonite porphyry at 1200 ft depth called for drilling the area from south to north, specifically from Adams Hill to the section covered by the Bullwhacker and Holly mines. A total of 8 holes was drilled (see map) with the rotary rigs mentioned to an average depth of 1200 ft.

No mineralization was found in holes 101, 102, 103a, and 104. Ore widths intersected in the other holes range from a minimum of 1½ ft in hole 103b to a maximum of 15 ft in holes 103b and 106. Gross values per ton range from $53.35 to $224.84 (calculated using lead at 15c per lb; zinc, 10c per lb; gold, $35 per oz; and silver, 90c per oz).

Drilling was completed during October 1953, and an underground exploration campaign launched to obtain further information. The plan called for sinking an 1100-ft shaft at a point halfway between hole 103 and hole 106, followed by lateral work and drilling from established levels. The shaft now being sunk is known as the T. L., named after Thayer Lindsley, president of Eureka Corp.

Preparatory work carried out during January and February 1954 included clearing the shaft site, erecting a surface plant, and constructing a 6000-ft powerline from the 6000-kw diesel power plant at the Fad shaft to the new shaft site. Sinking began March 16, 1954, and by mid-November had reached a depth of 850 ft.

The shaft contains 4 compartments, each 4x4 ft inside the timbers. The square cross-section in the rock measures 11x11 ft. Shaft sets made from 8x8-in. timber are prefabricated in northeast California and brought to the mine by trucks.

## Sinking Practice

Sinking follows standard practice. The V-cut round of 30 to 36 holes is drilled with Thor and I-R sinker drills using 1-in. quarter-octagon steel with detachable tungsten-carbide bits, if it is blasted with 40% dynamite.

Broken ore is loaded into the sinking bucket by a clamshell mucking machine. The complete shaft cycle, that is, drilling, blasting, pumping down, mucking, and placing timber sets at 5-ft centers, resulting in a 5-ft advance, requires about 30 hr.

Operating crew on each shift consists of a hoist man, top man, shaft leader, and 3 shaft men. The shaft currently makes about 100 gpm, and, based on records obtained from the neighboring Bullwacker and Holly mines, the management is confident that the flow of water will not be comparable to that in the Fad shaft.

From levels that will be cut at about 100-ft intervals, drill holes and drifts will be put out to reach the orebodies. The 785-ft level will be used for drilling operations only. On the 580-ft level is a pump station housing two I-R 4GT centrifugal pumps and sump receiving the discharge from a B-J sinker pump capable of delivering 200 gpm against a 300-ft head. The sta-

(*Continued on p. 99*)

# What Chance Has Foreign Capital in Peru

- **What was done to establish the new mining code**
- **Why it has encouraged foreign investment**
- **How Peru is being benefited by the exploitation of its low-grade ore deposits.**

CHARLES WILL WRIGHT
New York, N. Y.

PERU'S PRESENT MINING CODE was drawn up by the combined efforts of the various mining organizations, including the Mining Bank of Peru and the Chamber of Commerce; presented to the Peruvian Congress and promulgated by Decree-Law 11357 on May 12, 1950. It is designed to open the way for domestic as well as foreign investment in this important phase of Peru's economy. It also stipulates that concessionaires with inactive and nonproductive holdings are obliged to exploit their concessions or forfeit their rights. To encourage the development of small mines the code includes a provision permitting Mining Bank (Banco Minero) to finance mine developments by loans. A copy of this code was published by the U.S. Bureau of Mines in Mineral Trade Notes as a Special Supplement No. 35 to Vol. 31 No. 6 and later modifications in No. 37 to Vol. 32 No. 4.

A letter to World Mining Consultants dated Sept. 2, 1954 from the U.S. Ambassador in Lima, in reference to a survey of sources of mineral supply in Latin America, states as follows:

"We here in Peru are relatively fortunate in having laws which on the whole have proven attractive to the investment of private foreign capital in the mining and petroleum industries. The influx of such venture capital during the past few years gives ample proof of the wisdom of the Peruvian Government in adopting sound and progressive legislation for the development of its mineral resources. Of course there is always room for greater investment and it is to be hoped that the type of survey which you propose will stimulate interest in financial quarters that are not yet familiar with what Peru has to offer."

A U.S. Bureau of Mines questionnaire was submitted early in 1953 through the Department of State to Peruvian Government mining bureaus and directors of the local mining companies. Here are the questions and answers:

**1. What is the Government mineral policy?**

A liberal policy with respect to the exploitation of mineral resources has been adopted with express purpose of attracting foreign capital.

**2. To what extent does the Government aid and control the mineral industries?**

The Government aids but does not control the mineral industries. As an example, the Banco Minero del Peru was created in 1940 with Government funds to foster the exploitation of mineral resources. It is active in promoting mine developments and the installation and operation of ore treatment custom plants, being directed by private miners and bankers. The National Institute of Mining Investigations and Development and the National School of Engineers are also maintained by funds derived from mine taxes, and study ways and means to make better use of the nation's mineral resources. These Government-assisted operations are of minor importance to the industry as a whole but of a real value to the small producer.

**3. What are the mining code regulations regarding ownership of mineral enterprises?**

Any person foreign or national may obtain the right to explore for five years and to exploit indefinitely all types of mineral lands owned by the State. These rights will be conceded free of charge (except for small registration fees) to the mine concessionaire who requests them for the development of his mine. A foreign person or company may not own concessions within 50 km of the border.

**4. What limitations apply to foreign capital participation in mining enterprises and to the export of profits and return of invested capital?**

In general Peru offers wide facilities to foreigners who wish to invest capital on an equal footing with Peruvians. Eighty per cent of the personnel employed by a mining company must be Peruvian nationals; however, the said company may employ any number of foreign specialists or technicians. Profits of mining companies as well as invested capital may be remitted to their home offices with practically no restrictions. Exporters are required to surrender 100% of the proceeds of dollar, sterling, and French franc exports for foreign exchange certificates. For remittance of profits and other service payments with certificates, a permit is required from the Ministry of Finance. For remittances at the free draft rate, there are no restrictions whatsoever.

**5. What is the export tax, if any, on mineral products?**

There is no export tax as such. There is a 4% ad valorem tax on metallic substances and 2% on coal and nonmetallics made at the time of shipment and based upon settlement returns from buyer. Credit slips are given for these tax payments and the amounts are deducted from future income tax or may be transferred to other exporters.

**6. Are new mine developments exempted from the import duty on machinery and necessary supplies?**

Machinery and supplies for use by the mining industry are exempted from all or part of the import duty. The

duty is usually based on category and weights.

**7. What is the Federal tax on mining concessions?**

There is an annual land tax per hectare as follows:

S/ 1.50 for gold concessions.

S/ 20.00 for other metallic concessions.

S/ 7.50 for carboniferous and other non-metallic concessions.

The concessionaires of surface installations and adits shall pay S/ 100.00 per year and per hectare of surface or underground area occupied. This tax to become effective one year after approval of title.

**8. What is the income and surtax on large and small mining operations?**

The only tax payable is the regular income tax on net profits which may vary from year to year. However, the 4% ad valorem levied on the products exported may be considered an advance on income tax.

All corporations, foreign and national, are now subject to the following taxes on profits:

| | | | |
|---|---|---|---|
| To | | S/ 10,000.00 | = 10% |
| From S/ | 10,000.00 to S/ | 30,000.00 | 7% |
| From | 30,001.00 | 50,000.00 | 12% |
| From | 50,001.00 | 70,000.00 | 15% |
| From | 70,001.00 | 100,000.00 | 17% |
| | 100,001.00 | | 20% |

In addition, foreign corporations pay a basic 12% tax on profits.

**Article 54** of the new mining code states:

A depletion allowance is made of 15% of gross value of exports with a limitation of said amount to 50% of the net profit.

**Article 56 states:**

The concessionaire may request the Executive Power to substitute the income tax with a participation of the State in the profits of exploitations. This participation would be fixed by mutual agreement according to the circumstances, between 10 and 20%.

When circumstances justify it, the Executive Power has the right to negotiate contracts with the concessionaire designed to permit installation of new power plants or mineral treatment plants and to development, fixing the amount of the income tax payable during a given period between 10% and 20% according to the specific circumstances.

**9. What are the Federal controls as applied to sales of mineral products abroad and exchange rates?**

All exchange transactions are made through any bank. Exporters receive exchange certificates at rates arrived at in the free market. Payment for permitted imports is effected through these certificates.

**10. Are dividends or profits subject to additional taxes?**

On bearer shares there is a tax of 15% on dividends which is collected at source.

**11. What are the Provincial, State, Municipal, or other local taxes on mining enterprises?**

None.

**12. Does the Government waive certain taxes to encourage new mine production?**

Payment of income tax and land tax exempts the mining company for 25 years from any further taxes, national, regional, or local of any kind or description which are in existence or are promulgated in the future.

**13. Is labor under union control and does the Government adopt a neutral attitude in labor-management relations?**

Labor union leaders do not have effective control of the workmen in the mineral industries but their power is gradually becoming greater. The Government remains neutral in labor disputes but supplies protection to industry if necessary.

**14. Is there a minimum wage for labor and what are the obligations to labor and employees in case of a suspension of mining operations?**

There is no minimum wage law but wages are based on the cost of living. Statistics concerning wage rates and hours occasionally published by the Direccion Nacional de Estadistica. In case of work suspension, two weeks advanced wages are paid to workmen, and salaried employees are entitled to an extra month's salary for each year of service.

Peru's tax setup, which is based entirely upon profits plus a small land tax, has encouraged a number of important exploratory and development projects during the past few years. Mining companies are exempt from further national or regional taxes for 25 years and liberal allowances are made for depletion. Among the companies encouraged by this favorable economic climate are:

**Marcona.** Utah Construction Co. and Cyprus Mining Co. decided in January 1953 to invest about $9-million in the Marcona iron ore project after establishing reserves of 70-million tons of 60% iron ore. By the end of October 1954, shipments of ore from the property totaled more than 2,250,000 tons.

**Republic Steel Co.** has taken an option on 65,000 acres of potential iron ore deposits about 60 km east of the Marcona mine.

**Cerro de Pasco Corp.** started a zinc development program in 1950 which is scheduled for completion within the next two or three years, representing a total investment of approximately $44-million.

## Small, Richer Ore Deposits

Peru is fortunate in having hundreds of small mines, many of which are still being worked by "gambusinos" using the most primitive methods. During the past few years, the smaller mining companies with venture capital have taken over a number of these properties with relatively rich ore, supplied mining and milling plants, and the mines are now profitable producers. Peru's mining code has greatly encouraged both domestic and foreign capital to risk investment in such small mines in the hopes that they may become large ones.

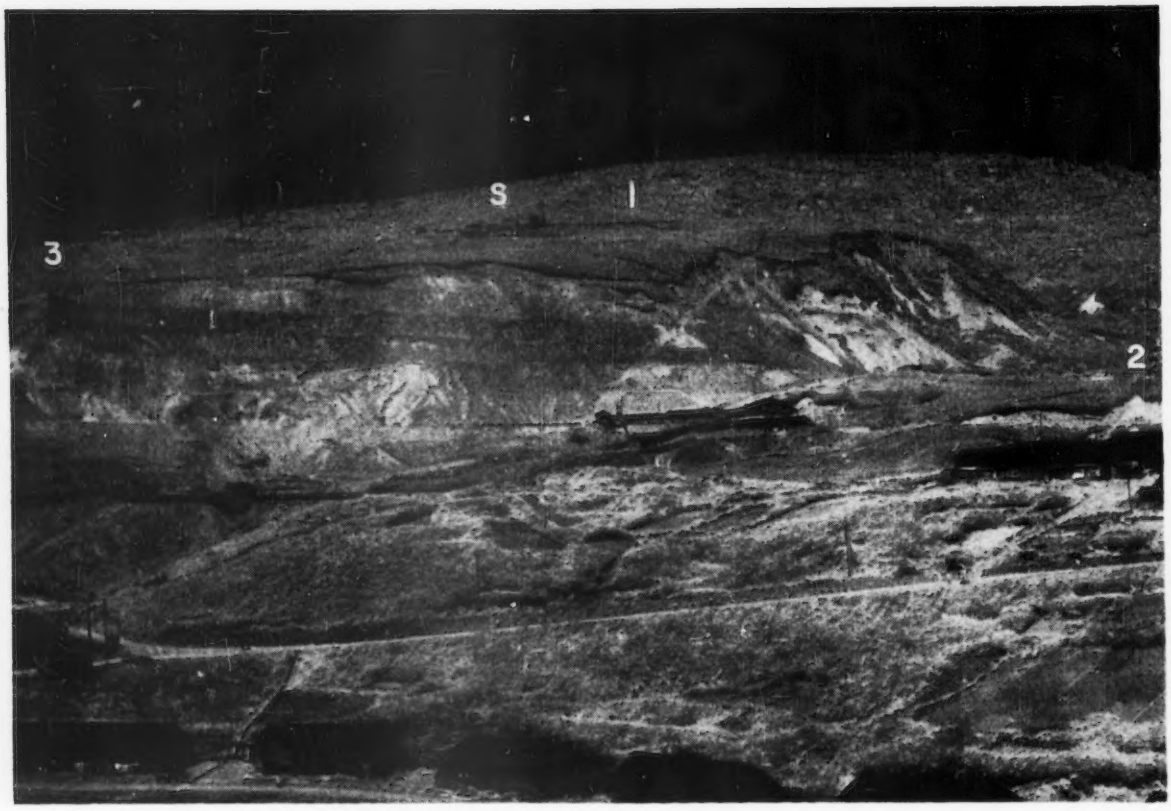
## U. S. Taxes on Mine Profits

Citizens of the United States who contemplate investing in a Peru mining venture should not overlook the possible application of U. S. taxes to the profits of the enterprise.

Dividends paid by the enterprise will be taxable to U. S. citizens regardless of where they may reside. For this reason U.S. investors may want to consider contributing part of the initial investment for stock and part for the companies' promissory notes. If the ratio of loans to stock is kept at a reasonable level the subsequent repayment of the loans out of profits should not be treated as a dividend and therefore should not be taxable.

## Conclusions

This summary of Peru's mining code is presented because of the present interest in the sources of mineral supply within the Americas and the urgent need to encourage private capital to cooperate with the mine owners in the development and profitable exploitation of their properties. It is hoped that the local government and private mining organizations and companies in certain of the other mineral-producing republics such as Mexico, Brazil, Chile and Bolivia will study the various articles in the Peruvian mining code and follow Peru's example in drawing up new decree laws with definite recommendations in regard to mine taxation, tariffs and exchange control. For the past decade or more, proposals to modify present mining codes in Mexico, Brazil, etc., indicating changes that would be of real benefit to the economic welfare of the nation have been prepared, discussed and presented for approval but as yet no action has been taken.




**THE MATSUO PROPERTY** includes (1) the No. 1 orebody; (2) the No. 2 orebody; (3) the No. 3 orebody; and (S) a 355-m ventilation shaft. (3) marks the new deposit discovered by geophysics. No. 3 orebody contains more than 10-million tons.

# Three-Way Geophysical Method

**Matsuo's No. 3 orebody was indicated by a spontaneous polarization survey, localized by an apparent resistivity survey, and confirmed by a seismic survey. The author tells why and how it was done.**

DR. YOSHIZO FUJITA
Consultant, Matsuo Mining Co.

JAPAN'S MINERAL RESOURCES are many and varied, and constitute one of the most important sources of wealth that provide the backbone of its industrial development.

Sulphur production has almost always exceeded domestic demand. Among the working sulphur mines in Japan, the Matsuo mine is the largest, accounting for one third of the total production of the country. The Matsuo mine is also the foremost pyrite mine, supplying as much as 40% of Japan's total production. Total annual production of sulphur ore and pyrite for 1952 was 926,793 tons.

Up to the present, three orebodies have been located at the Matsuo mine, all of which are huge massive deposits. The No. 1 orebody was accidentally discovered by wood cutters 50 yr ago when they made a fire. Attracted by the peculiar odor, they took notice of a piece of burning sulphur ore, which led to the discovery.

One of the prospect drill holes in the peripheral area of the No. 1 orebody penetrated an orebody over the discontinuity line that appears topographically to be fault. This orebody was proved by further drilling, called the No. 2 orebody.

The No. 3 orebody was discovered by electric geophysical prospecting. It has been explored by drifting and drilling since 1950. Data pertaining to these three orebodies appear in Table 1 on p. 88.

Ore production from the Matsuo mine totaled more than 12,600,000 tons by the end of March 1953.

A general account of the discovery of the No. 3 orebody follows:

## The Aim of Geophysical Prospecting

When the author returned to Japan in 1935 after finishing two years study in Europe and America, he gave lectures "On the Trend of Progress in Geophysical Prospecting," in which it was predicted that the apparent resistivity method would gain wider recognition as an electric geophysical method. The author had conducted

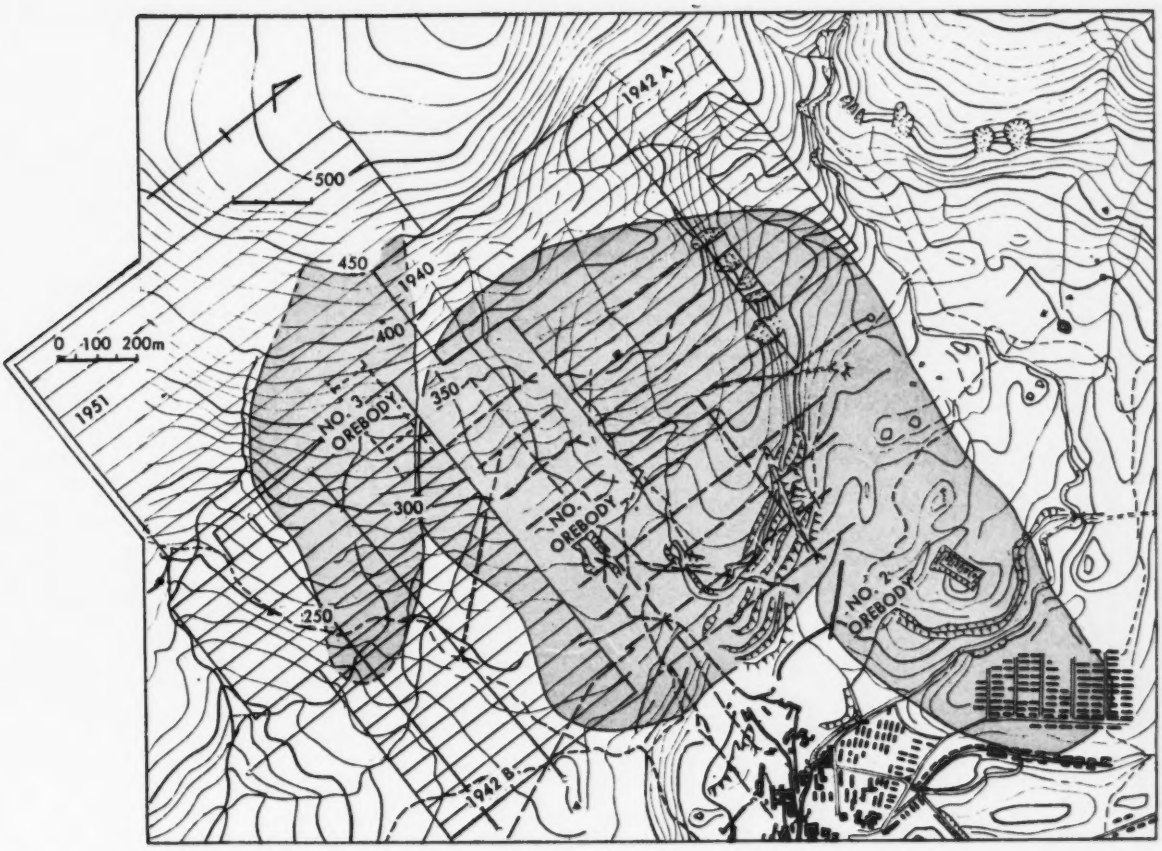



**FIG 1. TOPOGRAPHICAL MAP** of the Matsuo mine and territory that was investigated by the geophysical methods outlined in this article. Dotted lines indicate mine adit levels. No. 3 orebody contains 3.3-million tons of native sulphur.

# Points Up Huge Pyrite Deposit

research work on this method to improve it, and as a result, developed the resistivity gradient method.

As the experimental research of resistivity gradient method in the laboratory was almost completed at the end of 1939, he requested the Matsuo company to permit experimental field work on their property. Thus it was possible to test the method and compare its efficiency with that of other electrical prospecting methods. In addition, the tests were planned to reveal any new orebodies that might exist in the area and to estimate the extent of the existing deposit. Field tests were carried out during 1940, 1941, and 1942. After the author resigned from Kyoto University and became a consultant for the Matsuo mine, the work was continued in 1950 and 1951.

## Geology of Matsuo

The surface rock at the Matsuo mine consists of olivine andesite and decomposed red earth. Underlying strata consist of alternate layers of pyroxine andesites, tuff breccia, and agglomerates. The deposit was formed by replacement of parts of these layers. Replacement involved kaolinization and opalization in places.

## Progress of the Work

Of five electrical prospecting methods: namely spontaneous polarization, apparent resistivity, resistivity gradient, electromagnetic and potential drop ratio; the first three methods were found to be more effective. Accordingly, the last two methods have been dropped since 1942.

It is best to determine the location of a probable orebody and its rough extent by the spontaneous polarization method first. Only after this preliminary work is done is it advisable to employ the resistivity method where the probable orebody is believed to exist.

## Spontaneous Polarization

The author used a potentiometer and two non-polarizing electrodes each of which was constructed by immersing copper wire in super-saturated copper sulphate solution in an earthenware pot. The lead wires were connected flexibly. The stationary electrode was purposely fixed on a point directly over the orebody, and the movable electrode was moved from one station to another. The potential difference at each position was then measured. When measurements were completed, equipotential lines were traced step by step. From the neutral equipotential line that passed through the stationary point, consecutive lines were drawn in positive and negative sides of this neutral line with 50-mv interval. See Fig. 2 for the equipotential chart thus obtained.

In the equipotential chart of 1940-B district, the voltage dropped gradually eastward from the stationary point, i.e.

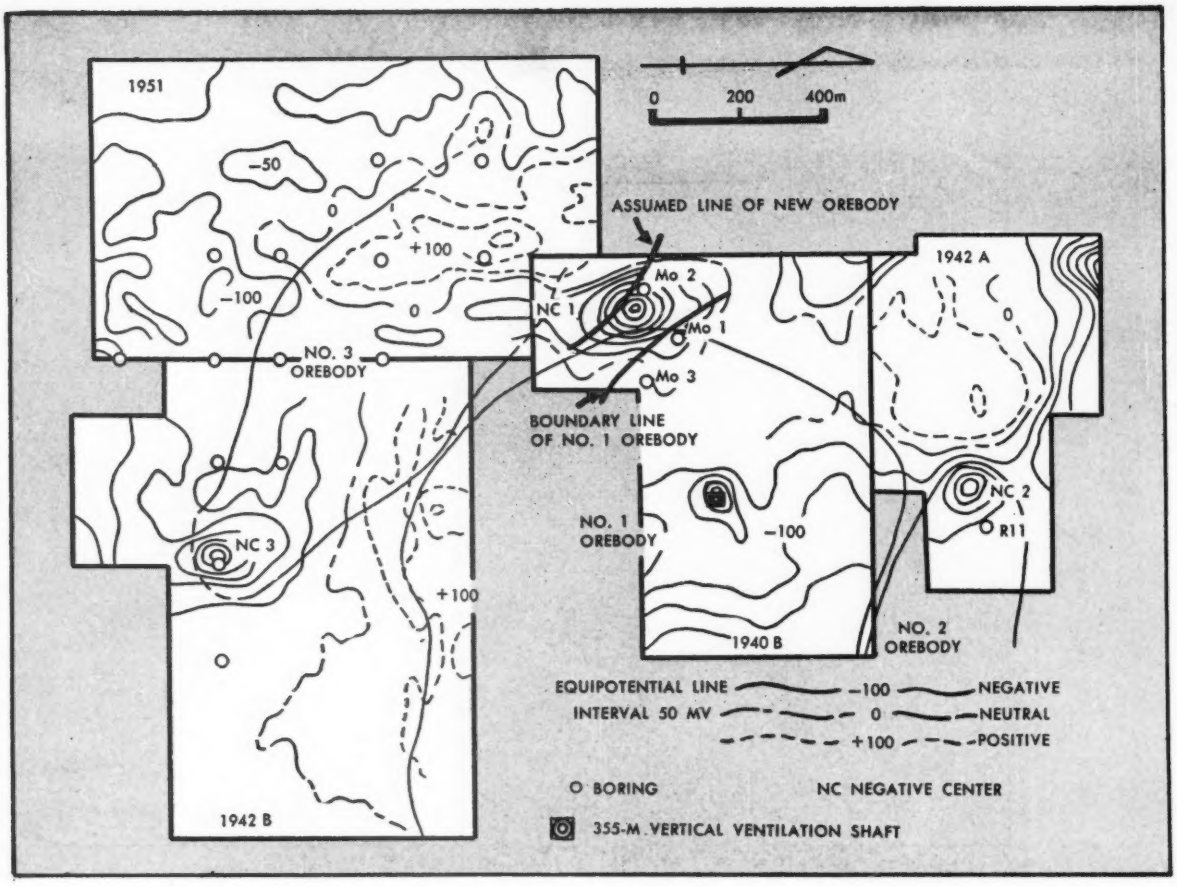



**FIG. 2. EQUIPOTENTIAL CHART**, and positions of exploration drill holes from the surface

approaching towards the center of the No. 1 orebody as clearly seen in Fig. 2.

A negative center at a 355-m vertical ventilation shaft was observed. This, however, was only a local phenomenon due to the fact that the vertical shaft was sunk through the orebody. Such an example was also cited by Schlumberger in *E&MJ*.

Besides the above mentioned negative center, three other negative centers were found, as indicated in Table 3. NC 1 (abbreviation of Negative Center 1) was located at a point about 300 m west from the western extremity of the No. 1 orebody, where excavation was in progress. Just at that time, trial drill hole No. 1 had been executed on the hanging wall side on the assumption that the No. 1 orebody possibly extended as far as this position. This trial drill hole encountered an orebody within 100 m. While the hole No. 2 drilled on the footwall side which lay farther west was barren, hole No. 3 drilled on the SE side of the No. 1 again encountered an orebody within 110 m. Hence it was concluded that the western extremity of the No. 1 orebody was located at the east side of NC 1.

As the NC 2 in 1942-A territory was believed to be located at the western extremity of the No. 2 orebody because of similarity of the ground, hole R 11 was drilled at the east side of the NC 2 (the hanging wall side) which struck an orebody within 48 m. Considering these facts a conclusion can be drawn that the No. 2 orebody reaches as far as NC 2.

NC 3 was located quite far south of the No. 1 orebody. Inference was drawn from the measurements made by apparent resistivity and resistivity gradient methods, that the phenomenon must have been caused by the existence of a new orebody (No. 3 orebody), whereupon hole No. 3 was drilled in 1952, and struck an orebody within 125 m as expected.

The equipotential lines near NC 3 had a tendency to extend somewhat in the NS direction, which tendency, however, was gradually altered by changing the direction to EW when the potential drop got lower than —100 mv. Between the neutral equipotential line in 1942-B territory and the No. 1 orebody, a positive zone developed and the peak of this potential gave a value +223.3 mv.

## Apparent Resistivity Method

This method, originated by Wenner, was applied to exploitation work by Gish and Rooney. Since Tagg devised a convenient measuring device it has gradually attained the level of practical utility. So far as the author is aware, there is no literature on the interconnection between the subterranean orebody and the apparent resistivity curve on which the prospecting judgment is to be based. Without such criteria, the resistivity curve would have little value, for what we are interested in is not the resistivity itself but the intrinsic property of the orebody which manifests itself as characteristic points in the curve. In order to establish correspondence between the orebody and the characteristic points, it was necessary to perform experiments with miniature specimen suspended in an homogenous medium and prove that the obtained result is valid in actual field work. With this objective, the author has conducted experiments in the laboratory of Kyoto University since 1935. For the specimen conductor, copper plate of proper size was used, and glass

plate for the insulator. Investigations showed how the variations of existing conditions of the specimen plate in the line of measurement and electrode spacing etc., bear on the characteristic points of the curve.

Actual field work, comprising not only the Matsuo mine but other mines in Japan, Korea and Manchuria, was conducted in the light of the laboratory experiment which led to exceedingly satisfactory results.

One of the curves obtained in the Matsuo mine by using the apparent resistivity method is reproduced in Fig. 3. Here the measure line of investigation passes through NC 1 in NS direction; electrode spacing was 40 m. If the extent of the existing conductor is presumed by comparing it with the basic type curve given in laboratory experiments, it is logical to infer that either two conductors lie at station points 10 and 17, or that one conductor lies at station point 13, in addition to the indicated conductor between two station points —19 and 2.

At any rate the indication from the apparent resistivity curve shows that the conductor does not spread all over this measuring line, but that two or three conductors lie in the area separated by non-conductors such as country rock.

Resistivity value given by apparent resistivity methods remains always positive and furthermore its variation decreases sensitively as either the electrode spacing is increased or the depth of the orebody is increased—i.e. the kick appearing on the resistivity curve loses its distinctness. Since the presumption of the existing position of the orebody is indicated by the position of kick or inflexion point in the curve, it is a disadvantage to have the precision of kick or inflexion point less distinct.

To remove these difficulties, the author has devised the resistivity gradient method which is capable of not only giving kick and inflexion points more distinctly, but also showing the condition of variation of the curve more plainly. This, however, does not complicate the technique of the survey, equipment required, or computations involved.

In the case of a conductor, it is more profitable to consider the next gradient, since in the first gradient the boundaries appear as inflexion points whereas in the second gradient (the word gradient is not correct in a strict sense, it is actually the Laplacian derivative or simply the second derivative in one dimension) they should appear as maxima. Practically, however, these values can be effected by taking the mean of the abscissae of minimum and maximum of the first gradient curves for the horizontal coordinate insulator the corresponding values will appear as maximum and minimum.

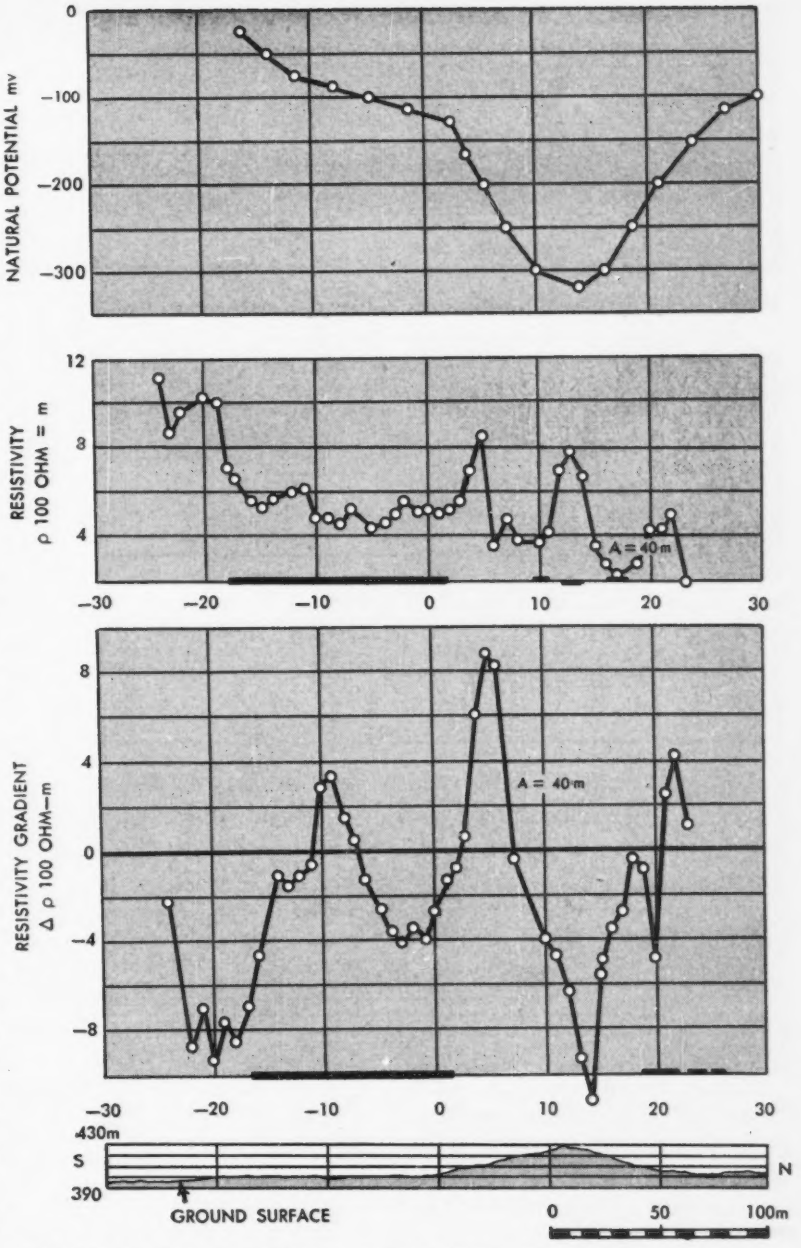



**FIG. 3. NATURAL POTENTIAL,** apparent resistivity, and resistivity gradient curves obtained on the line passing through NCl in a North-South direction.

## Resistivity Gradient Method

If the resistivity gradient curve given in Fig. 3 is compared with the result obtained in the laboratory experiment, and if the extent of the existing conductor in the measure line is presumed, there seem to exist two conductors, one between station point —16 and point 2 and the other near station point 18. The interval of 160 m lying from station point 2 to station point 18 is a typical insulator, which is country rock according to the evidence of drill hole No. 2. By interpreting the result of measurements, the author has concluded that there must exist an independent orebody between station points —16 and 2, located on the SW side of the No. 1 orebody. This new orebody (No. 3) has been proved.

## Seismic Method

Even in a circumstance where the negative center is definitely determined, and the potential distribution

**Table 1. Data pertaining to the Matsuo orebodies.**

| No. of orebody | | No. 1 | No. 2 | No. 3 |
|---|---|---|---|---|
| Dimension (in m) | E W direction | 1,150 | 1,300 | 900 |
| | N S direction | 950 | 500 (max) | 450 |
| | Thickness | 80–150 | 30–90 | 20–45 |
| Dip angle toward east (in degree) | | 8 | 11 | 7 |
| Ore reserves in millions of tons | | 141 | 68 | 10 |
| Thickness of overburden, m. | | 40–150 | 40–150 | 100–180 |

Remarks: The No. 3 orebody is being exploited at present, and its quality was found to be superior to the other two.

**Table 2. Outline of geophysical prospecting.**

| Time | Method | Territory | Objectives |
|---|---|---|---|
| 1940 | Electric | B | Discovery of western boundary of the No. 1 orebody and the new orebody |
| 1941 | Seismic | 1940-B | Confirmation that the negative center indicated an orebody and not subterranean water |
| 1942 | Electric | A | Discovery of western boundary of the No. 2 orebody and new orebody |
| 1942 | Electric | B | Prospecting the new orebody (No. 3) |
| 1950 | Seismic | 1942-B | Confirmation of the new orebody (No. 3) |
| 1951 | Electric | | Prospecting the new orebody (No. 3) |

**Table 3. Negative centers.**

| Time | Territory | Voltage in mv Max | Voltage in mv Min | Max var. in mv | No. of negative center |
|---|---|---|---|---|---|
| 1940..... | B | +111.5 | −318.5 | 430.0 | NC 1 |
| 1942..... | A | +190.0 | −467.0 | 657.0 | NC 2 |
| 1942..... | B | +223.3 | −404.4 | 627.7 | NC 3 |

**Table 4. Exploratory drill holes put down as a result of geophysical prospecting.**

| | No. of borings from surface | | | | No. of borings in underground | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Total length | | | | Total length |
| No. of orebody | Total | + | − | m | Total | + | − | m |
| 1..... | 3 | 2 | 1 | 644.00 | 3 | 2 | 1 | 618.53 |
| 2..... | 1 | 1 | 0 | 200.00 | 1 | 1 | 0 | 88.50 |
| 3..... | 9 | 6 | 3 | 2,111.20 | 9 | 8 | 1 | 631.16 |
| Sum..... | 13 | 9 | 4 | 2,955.20 | 13 | 11 | 2 | 1,338.19 |

Remarks: +orebody encountered, −orebody not encountered.

indicates the existence of an orebody, one cannot presume existence of an orebody with assurance, since a water pool or strong acidic water can produce similar effects. Such examples were noted by the author in Japan, also in Korea. Furthermore, in the Matsuo mine what is commonly called "Baiko" contains not only pyrite but also marcasite. While they both have the same molecular formula $FeS_2$, their physical properties are entirely different, the latter being water soluble while the former is not. Hence underground water is occasionally strongly acid. Also several traces of subsidence are observable on the earth surface. From these observations, a subterranean water pool could exist. Therefore it is of primary importance to determine whether the conductor indicated is an orebody or an underground water pool.

To solve this problem, it is necessary to distinguish between the physical properties of an orebody and a water channel or pool by some means. Gravitational and seismic methods may be used. The author has investigated comparisons between gravitational and seismic methods with respect to metallic orebodies since 1930. This led to a decision to re-examine the result obtained by electrical prospecting 1940-B district by the seismic refraction method. Results showed that below about 100 m a rigid substance was present with a speed rating of about 3,000 m speed per second. This clearly indicated the presence of an orebody.

## Summing It Up

The spontaneous polarization method affords speediest measurement and the electromagnetic method the slowest. Consequently, to get a general idea promptly, the spontaneous polarization method is most suitable. However, this method has the same disadvantage as the potential drop ratio method and electromagnetic method as it does not give precise information. The resistivity methods, however, are more precise. In fact they are useful to determine the boundary of an orebody when the result of measurement is examined in the light of basic type curves compiled by the author as the result of theoretical and experimental research work.

Since the author concluded that the resistivity gradient method is most reliable for inferring the existence of orebody, he drew an assumed line of a new orebody as in Fig. 2 based on results of the resistivity gradient method. From this assumed line, he inferred that beyond the andesite belt of about 100-200 m, there must exist another orebody SW of the No. 1 orebody.

Despite the fact that the area is thickly overgrown with ambusha veilchili, and country rock is not exposed in the area prospected, the electric prospecting method yielded adequate and effective results on which search for the orebody could be based.

## Development of the New Orebody

Since 1941, trial holes were drilled from the surface as well as underground in the area where the orebody was indicated by geophysical prospecting. The western extremity of the No. 1 and the No. 2 orebodies were determined by surface drilling as shown in Fig. 2. Prospect drilling was discontinued before long owing to the World War.

After the war a plan was made to prospect for the orebody which had been neglected so many years. The first horizontal drilling was started west of the end of the No. 10 EW drift, the starting point being utmost SW end of drift. This horizontal hole encountered an excellent sulphur ore within 29 m. Content exceeded 40% free sulphur. Consequently, it was drilled as far as possible reaching 310 m. At the end of 1949, drilling was completed proving the actual existence of the No. 3 orebody. Encouraged by the result of prospecting, drilling and geophysical prospecting were continued from the surface, as well as drilling underground. Data for 26 drill holes totaling 4,290,39 m is shown in Table 4.

To date more than 10-million tons of ore has been confirmed, and further investigation is being made of a NW extension of the orebody. Native sulphur content of the No. 3 orebody is about 3.3-million tons.

The author wishes to express his indebtedness to Hugh Wright and R. H. Ramsey whose efforts encouraged publication of this paper.

# Electric Braking Systems For Mine Locomotives

A. B. CHAFETZ, Plant Engineer, International Minerals & Chemical Corp., Carlsbad, N.M.
FELIX BERRA, Chief Electrician, Phelps Dodge Corp., Morenci, Ariz.
R. D. CALL, Supervisor of Engineering & Service Dept., Westinghouse Electric Corp., St. Louis, Mo.
B. E. RECTOR, Industry Engineering Dept., Westinghouse Electric Corp., East Pittsburgh, Pa.

ELECTRIC BRAKING SYSTEMS for traction equipment can be divided into three general categories: magnetic track braking, regenerative braking and dynamic braking. Regenerative and dynamic braking systems are practically identical with the exception of the method used to dissipate electrical energy generated by the traction motors acting as generators when producing braking effort.

The magnetic track brake is essentially a direct current operated electromagnet. The unit is a long narrow electromagnet consisting of a coil held between fixed steel side plates to which are bolted renewable steel wearing strips. The shoe is suspended by a pair of springs so that the bottom of the shoe is about ⅜ in. above the rail surface. Shoes are mounted between the wheels of each truck and the two shoes of each truck are tied together mechanically by a steel framework which holds the shoes in alignment along the rail and also provides a rigid surface by which the drag exerted by the track shoes can be transmitted to the truck structure. The shoes receive operating excitation from a battery through a controller and resistances by which varying excitation and thus varying braking effort can be obtained. Battery supply for brake excitation permits use of the brake in emergency even under conditions of trolley dewirement or loss of trolley power.

One of the earlier forms of this type brake employed dynamic braking as well as magnetic braking. Traction motors were used as generators generating on a closed-resistor circuit. The dynamic current produced retardation in the motors and also energized magnetic track shoes. The motion of the magnetic track shoes toward the rail was mechanically transmitted to wheel-brake shoes. Thus, simultaneous application of dynamic braking, magnetic track shoe braking and wheel braking resulted. For holding the vehicle at standstill on grades the magnetic track brakes were energized by line current, thus becoming a direct electric brake.

## Regenerative Braking

The direct current series motor cannot be made to act as a generator and return power to the line without special arrangement to provide a definite and controllable excitation. The scheme commonly used to secure this effect is shown in the elementary diagram of Fig. 1 (a) and (b). In this scheme of regeneration the traction motor field is separately excited through a stabilizing resistance which carries the sum of the field excitation exciter current and the regenerated armature current. The positive terminal of the exciter armature is connected to ground so that the excitation current flows in a local loop circuit up through the stabilizing resistor and down through the traction motor field in the same direction as the current flows through the field during motoring.

The counter-electromotive force of the traction motor armature is of the same polarity as during motoring, that is, opposed to the line or the positive terminal connected to the line. It is apparent that the exciter can be caused to circulate sufficient current in the field to cause the motor voltage to exceed the trolley voltage. Any current in the traction motor field greater than that which would flow as a series motor for a given speed will overexcite the field and cause the counter-electromotive force to be raised above normal line voltage. This higher voltage on the traction motor armature will drive a regenerated current into the line.

This regenerated current will flow from ground up through the stabilizing resistance and the traction motor armature to the line. The regenerated current will flow through the resistance in addition to the field excitation current driven through this resistance and the field by the exciter. Any change in the voltage drop in the stabilizing resistance will affect the amount of field excitation current since this is part of the excitation circuit.

The stabilizing resistance makes the system stable against sudden fluctuations in trolley voltage. A sudden drop in line voltage while regenerating will tend to cause an excessive flow of regenerated current due to the difference between the existing locomotive voltage and line voltage. This increased regenerated current flowing through the stabilizing resistance will cause an increased voltage drop across this resistance. This increased voltage drop in the stabilizing resistance acting as an opposing voltage in the excitation circuit will in turn very quickly reduce

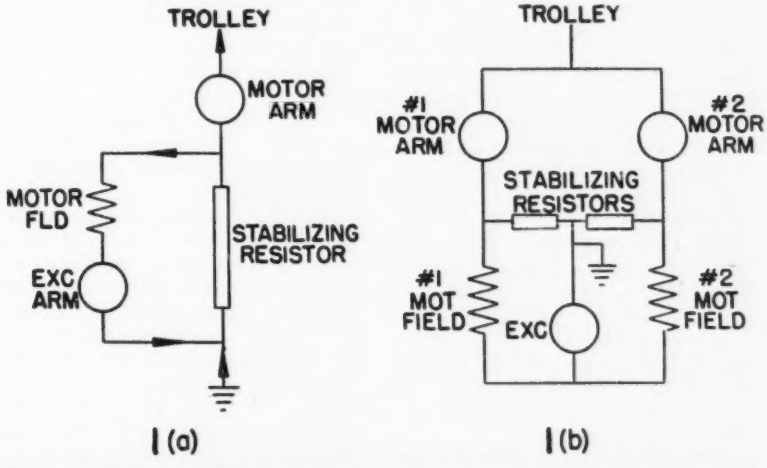



**FIG. 1. DIRECT CURRENT** series motor acts as a generator during braking periods in these two hook-ups and thereby returns power to the line.

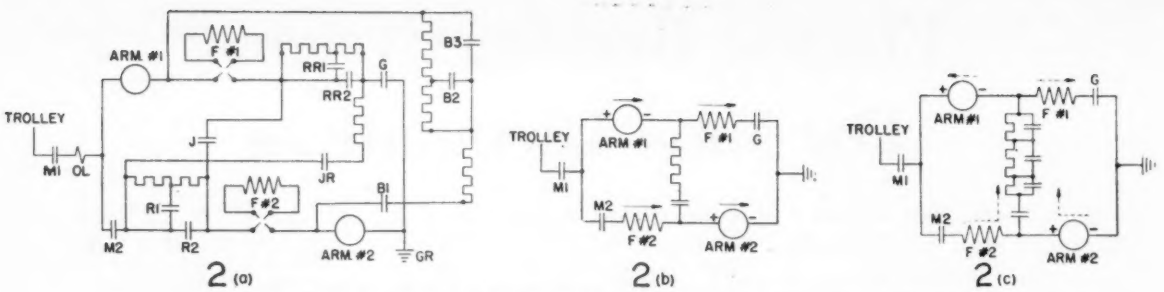



**FIG. 2. TWIN-MOTOR HOOK-UPS** for dynamic braking systems described below.

## How dynamic braking works in twin-motor systems

The above drawings show how twin motors act in a dynamic braking system feeding output into a common resistor. Fig. 2 (a) is the main circuit schematic of a two motor locomotive. On the last (highest speed) running notch of the controller, contacts M1, M2, G, R1, RR1, R2, RR2 are closed and current is conducted from the trolley through armature of motor #1, field of motor #1 to ground or rail. Likewise power flows from the trolley through armature of motor #2, field of motor #2 to the rail. Thus the two motors are operating in parallel and directly from trolley voltage since no accelerating resistance remains in series with the motors. Fig. 2 (b) is a simplified sketch of this schematic. The arrows indicate direction of current flow through the armatures and fields of the motors.

When the controller is moved through the off position to the first braking notch the contactors open and the motors are disconnected from the line. On the first braking notch contractors M2, G and B1 close. This sets up a circuit from armature of motor #1 through resistance spanned by contacts R1 and R2, field of motor #2, through resistance spanned by contacts B2 and B3 and thence to armature of motor #1. Also a circuit is completed from armature of motor #2 through resistance spanned by contacts B2 and B3, through field of motor #1, through resistance spanned by contacts RR1 and RR2 and then to armature of motor #2. On braking notch 2 contacts R2, RR2, B2 and B3 in addition to the above contacts close so that all resistance with exception of residual resistance between contacts B1 and B3 is removed from the circuit.

Fig. 2 (c) is a simplified schematic of Fig. 2 (a) during braking conditions. It is noted that the direction of current in the fields of the two motors remains the same as in Fig. 2 (b), since the field of motor #1 is being excited from armature #2 and the field of motor #2 is excited by armature of motor #1 even though the armature current of the two motors is opposite in the braking connection to that in the running or power direction. Also it is noted that the braking resistor is common to both motor circuits. Advance of the braking controller varies the amount of resistance in series with each motor and hence the speed at which full dynamic braking effect is obtained. See also text on p. 91.

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the traction motor field strength, thereby limiting the peak value of the regenerated current.

Two general schemes of controlling the regenerated current are in use. If the stabilizing resistance is fixed, variations in exciter voltage will be accompanied by variations in regenerated current. Similarly, if the exciter voltage is constant, variations in regenerated current can be obtained by varying the stabilizing resistance. The scheme using variable exciter voltage is most generally used since control equipment is less complicated and less expensive.

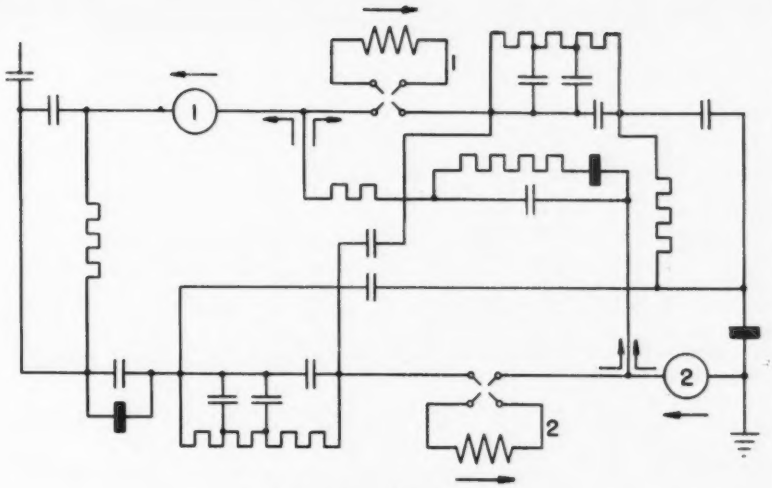
Regeneration is started by connecting the locomotive to the line with low field excitation on the motors and accelerating resistance in the circuit. The locomotive voltage is then either automatically or manually balanced to the line voltage. The main resistance is cut out of the circuit and the regenerated current is brought up to the desired value and the motors acting as generators will produce a braking effort.

The excitation generator may be motor driven or may be geared to an idle axle on the locomotive. Also one of the traction motors may be used as an excitation generator during regeneration.

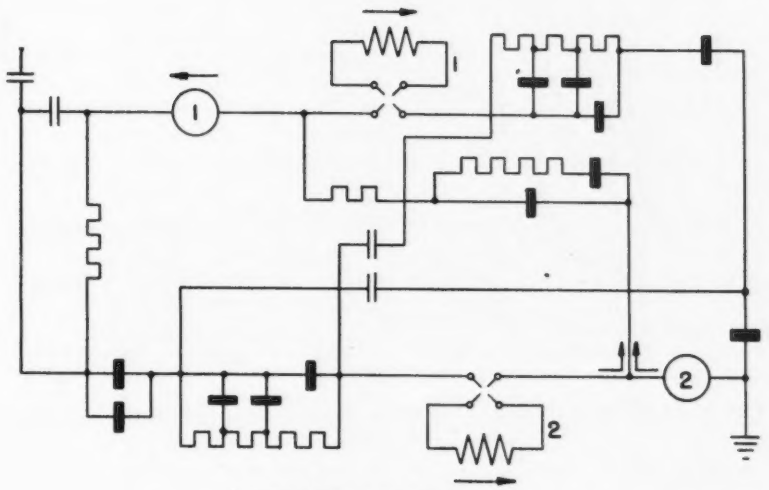
Regenerative braking is used mainly on transportation systems where long downgrades are encountered and it is desired to hold a certain speed. The regenerative brake is normally a "holding brake" wherein it is used to maintain or limit speeds. It is seldom used as a decelerating brake since the traction motors acting as generators must produce a voltage in excess of normal line voltage in order to produce a braking effort. If deceleration is required of this braking system, it is necessary that the regenerative braking exciter produce an increasing field current for the motors as speed decreases in order to produce the required armature voltage. This imposes a rather severe requirement on this unit as well as considerably complicating the control.

Some means must be present to absorb the regenerative energy produced by the vehicle undergoing braking. Oftentimes this is accomplished in the case of main line railroads by proper scheduling. Schedules are arranged so that a train is ascending a grade while another train is descending. The energy produced by the descending train is fed to the trolley system and then absorbed by the ascending train climbing the grade. This reduces the duty on the substation equipment by the amount of energy exchanged between the two locomotives. It is not always possible to arrange schedues to permit this type of operation and other means must be used to absorb the regenerative energy.

Regenerative energy produced under braking conditions can be pumped back into the ac supply line if the conversion equipment will permit interchange of power between the ac and dc systems. In the case where ac to dc motor-generator sets are used this interchange of power is easily accomplished. As the dc trolley voltage increases due to presence of regenerated energy, the dc generator of the mg set changes from generating to motoring action. The ac motor then acts as a




COASTING CONNECTIONS
3(a)




BRAKING CONNECTIONS
3(b)

**FIG. 3. FOR SAFE DYNAMIC BRAKING,** the motors must be kept in a responsive state the instant the controller is moved from coasting to the braking position. These diagrams show what takes place in the circuit during this transition. Black bars indicate closed switches.

generator and supplies power to the ac supply line where the energy is absorbed by other loads connected to the ac system. Where this type conversion equipment is employed, regenerative braking energy can be absorbed easily.

If mercury arc type rectifiers are used as a conversion means to supply dc to the trolley system the means for handling the regenerated energy are more complicated and expensive. This type conversion equipment will not interchange power as will the synchronous mg set and if it is desired to feed power in the ac system a rectifier inversion type equipment must be used. The equipment must act as a rectifier when the locomotive is taking current from the trolley and must act as a dc to ac inverter when the locomotive is producing regenerated current. Such equipment has been designed and applied; however, its operation is comparatively complicated and since the inversion equipment must be designed to handle all the regenerated power of the locomotive or locomotives descending a grade the inverter size is roughly equal to the rectifier capacity. This means additional investment cost.

Instead of attempting to utilize the regenerated energy by inverting it and feeding it back into the ac system, it can be dissipated in a resistor bank situated either on the locomotive or at the mercury arc rectifier substation. This requires control equipment which will switch the resistance in the circuit when regenerated energy is being produced and disconnect it when power is being drawn from the conversion equipment. The regenerated power is dissipated in the resistor and lost. It cannot be used as would be the case if it were inverted and fed into the ac system.

Regenerative braking is used mostly on these systems where long grades are encountered, when braking requirements are to hold or maintain a given speed downgrade, when proper scheduling can be worked out so that an upgrade train can utilize the regenerative energy produced by a train braking downgrade or where the conversion equipment permits a transfer of energy from the dc to the ac system.

## Dynamic Braking

Series traction motors can be made to act as generators and when so doing their torque is reversed and they produce a braking action. If the generated energy is dissipated in a resistance this action is known as dynamic braking.

If a series motor is driven from a mechanical source such as a locomotive axle and a resistor is connected across its terminals, it will not build up to act as a generator because of improper direction of current in the series field. However, where two motor circuits are available for interconnection, they will pick up generating voltage very quickly and give a prompt braking response. This interconnection consists of placing a resistor from a point between the armature and field of one motor to a corresponding point between the armature and the field of the other motor. Thus the armature of one motor feeds the field of the other and vice versa and braking is obtained. Each pair of motors, therefore, acts as a dynamic braking system feeding its output into the common resistor. See Fig. 2 (a, b, c).

Some of the advantages of this method of braking resistor connection are worth noting. In addition to the accelerating resistor steps in each motor circuit which are kept balanced in value at all times, the braking circuit is completed through a common loop, which carries the combined current from both motors and includes resistance steps of a value which essentially doubles the total effective resistance in each motor circuit. This total amount is determined by the excess voltage to be absorbed when applying the brake at maximum speed.

This cross-connection of motors, whereby each becomes separately excited, not only produces inherent stability and load equalization but also avoids skidding, since any tendency on the part of one motor to decrease its speed immediately reduces the field excitation of the other motor. This in turn reduces the voltage being applied to the motor which has attempted to slow down by creeping. As a result there is no sudden or complete loss of retardation.

## Spotting Circuit

To be sure that the motors are kept in a responsive state so that braking is achieved the instant the controller is moved to a braking position, a "spotting" circuit is sometimes employed. With motors of a residual voltage of 7 to 10 there is a time delay before the motors will build up voltage since this value of residual must force the field excitation current through the resistance of the braking circuit. In order to prevent this time delay and obtain prompt build-up of braking current without separate excitation, the brake loop current is closed through a high resistance each time the controller is moved to the off position. This recaptures the residual voltage before the field flux has collapsed and circulates a current of low value through this resistor. This current is not enough to cause any appreciable braking effect but is sufficient to keep the motor excitation built up so that brake application is uniformly prompt. Fig. 3 (a) is a diagram of motor circuit connections during "coasting" or "power off" conditions wherein pre-excitation is present. Fig. 3 (b) gives the transition to braking conditions.

## Motor Design

Traction motors required to perform braking service in addition to propulsion service are subject to greater duty than if propulsion service alone were required of them. A locomotive drawing a train or load less than normal or coasting downgrade may attain a speed greater than the normal balancing speed. If full rate braking is applied under this condition, the motors may be subjected to regenerated voltages two or three times rated line value. Also the extra heating produced in the motor must be taken into consideration. The motor must be capable of satisfactory commutation and have overload capacity to satisfy these conditions. In the case of self-ventilated motors, the extra heating is minimized since it occurs mostly at high speeds where the ventilating system is most effective. Generous commutating and insulation factors are essential design characteristics.

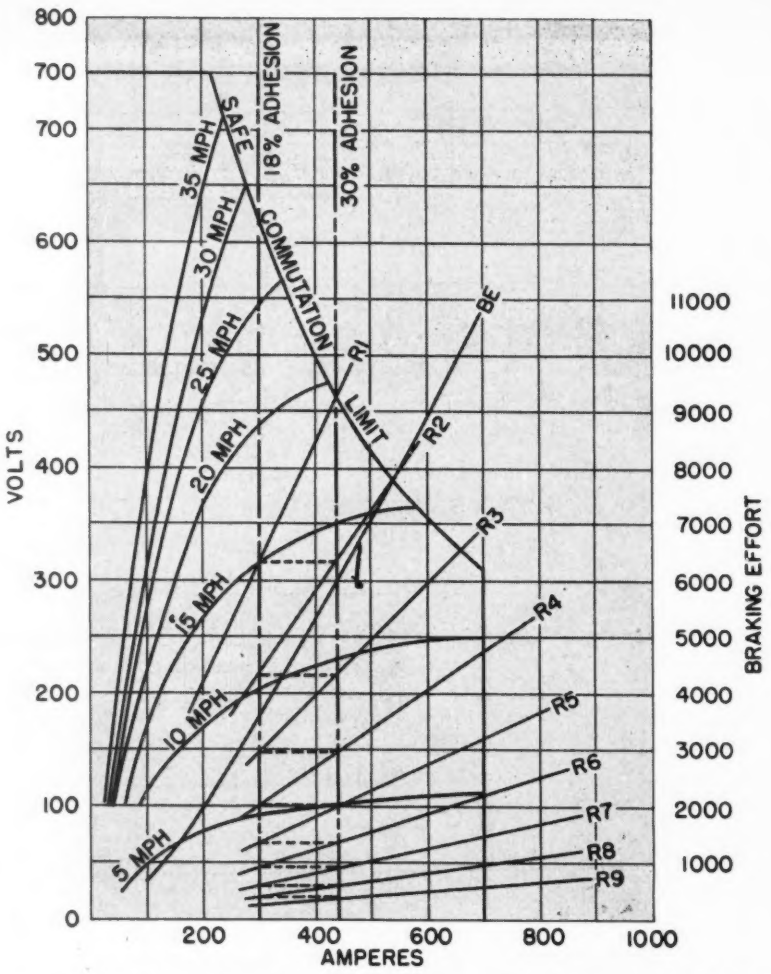



**FIG. 4. TYPICAL DYNAMIC CURVE** for decelerating a locomotive from 20 mph to 1 mph.

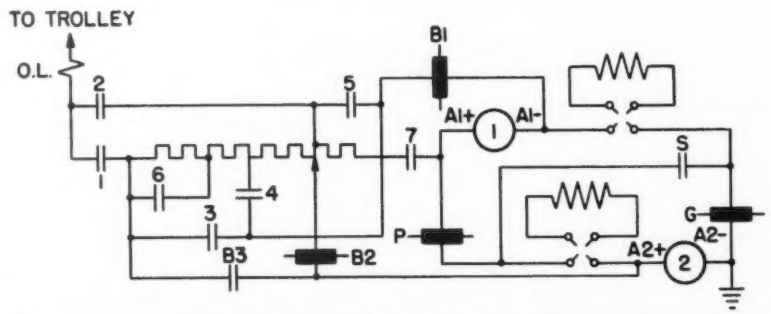



**FIG. 5. IF TROLLEY CURRENT FAILS,** the above hook-up shows how switches can be actuated (black ones are closed) to set up a braking system which dissipates generated braking current in the resistors at left.

Fig. 4 is a typical dynamic curve for decelerating a locomotive from approximately 20 mph to approximately 1 mph. Braking is accomplished between adhesion limits of 18% to 30%. Braking is initiated by moving the braking controller to the first braking notch. Such action disconnects the motors from the line and sets up the braking circuit through R1 resistance. This action causes the motor to produce a retarding force equal to the braking tractive effort at 30% adhesion. The locomotive will decelerate along the R1 line to an adhesion value of 18% as noted. At this point the dynamic braking current and hence the retarding force has

decreased to a value which permits the decelerating rate to drop below an appreciable value. To increase the retarding force it is necessary to cause the motor current to increase. This is accomplished by decreasing the value of dynamic braking resistance to a value R2. Switching in R2 brings the braking tractive effort back to the original value since reducing the resistance value permits the motors to generate the original value of current. By proper reduction of braking resistance the locomotive can be made to decelerate to a very low speed. The number of resistance steps and the value of each step is determined by the range of braking effort, decelerating rate, and maximum speed at which braking is to be initiated.

It is to be noted that if the braking resistance is selected on the basis of dynamic braking being initiated at a top speed of approximately 20 mph as shown by R1, this is the maximum speed at which braking can be safely obtained. Attempting to dynamically brake at a speed greater than 20 mph (for example 25 mph) exceeds the adhesion limit of the locomotive and the commutation limit of the motors since the resistance line and the speed line intersect at a point beyond the same commutation region. Under such conditions it is possible to flash the motor commutators or lose traction between locomotive wheels and rails. To prevent application of dynamic braking at excessive speeds where abnormally high voltage would be generated, an overspeed relay can be used. This relay will not permit the dynamic braking circuit to be established until the speed is reduced to the point where the generated voltages will be within the limiting safe value. The speed of the train must be reduced by use of the air brake equipment on the train cars or locomotive to the point where the relay permits the first point of dynamic braking to be applied.

## Dynamic Braking Systems

Braking conditions that exist on mine haulage systems, both underground and open pit, are as a rule more severe than any other branch of the traction industry. Grade and track conditions are extremely variable. In many cases the cars are without power brake equipment. This is especially true of underground systems. Therefore, the locomotive must provide all braking service. The dynamic brake supplementing the mechanical tread brake offers many advantages from a safety and dependability standpoint. Long grades in open pit systems are frequently encountered, and dynamic braking can be proportioned to absorb as much as half the total required braking effort.

## Circuit Modifications

To suit the many and varied conditions existing in haulage systems of different mine installations a number of modifications to the basic dynamic braking circuit and the dynamic braking control scheme have evolved. This simplest scheme is the one in which braking is accomplished by manual operation of the braking control lever by the operator. It is up to the operator's judgment not to initiate dynamic braking under conditions of excessive speeds which would produce overvoltage on the motors. Likewise the operator must judge when the braking control should be advanced to give proper deceleration and not advance the control so rapidly as to cause overcurrent and excessive braking effort which would exceed allowable adhesion values.

## Selective Current Limit

By the addition of an overspeed relay to the control, dynamic braking circuits can be held inoperative at speeds above which dynamic braking should not be applied. When the speed of the train has been reduced to the proper point by means of air brakes, this relay will permit operation of the dynamic braking circuits. By this means motor over-voltage due to application of dynamic braking at excessive speed can be prevented.

By the use of current limiting relays, the average braking effort produced by the motors can be regulated to a given value. The relay is set to operate at a given magnitude of braking current, this current corresponding to a given average braking effort or retarding force. If, on the first step of braking resistance, the current limit value is exceeded, the relay will prevent further reduction in braking resistance since contacts on the current limit relay will not permit the resistance switches to close even though the braking control lever is advanced. Each succeeding step of resistance reduction can occur only when the motor current is within magnitude of the relay setting. This prevents over-reduction of braking resistance and therefore excessive braking current and excessive braking force.

When the dynamic brake is applied as a holding brake to maintain speed down a grade, the use of current limit relays permits the dynamic brake to regulate for a given retarding effort from the motors. If the required retarding effort over a portion of the grade is greater than the amount when the dynamic brake will provide, the excess braking effort can be obtained by the use of air brakes on the cars.

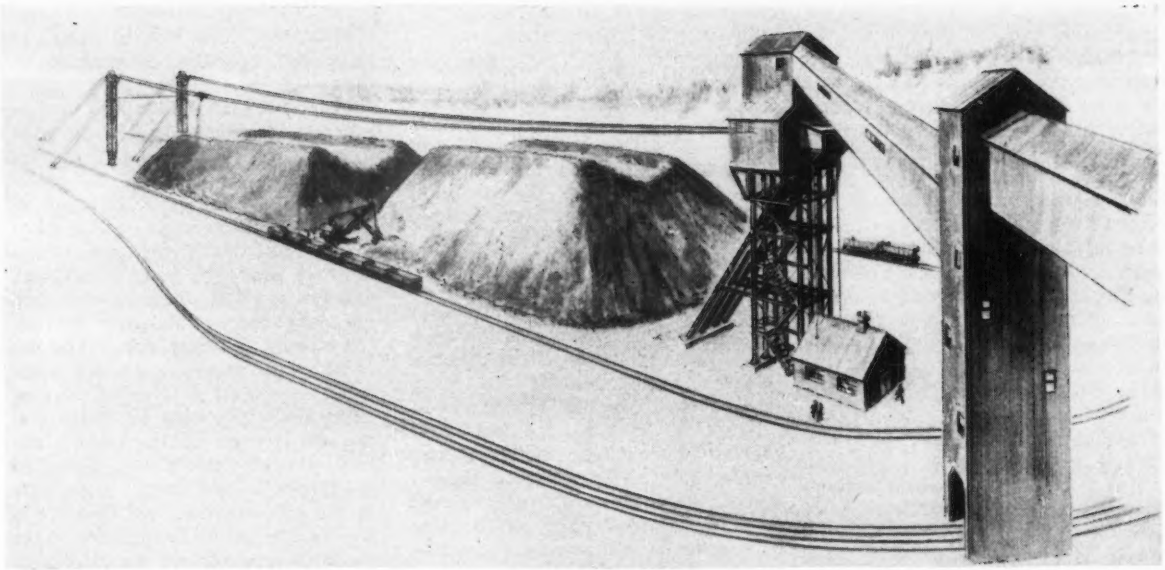
When the dynamic brake is used as a decelerating brake to slow the train to a very low speed point, current relays can be used to cut out resistance as the train speed decreases so that a uniform average braking effort is obtained from the top speed conditions for which the brake is designed, to a low speed at which air brakes on the cars or the locomotive can be used for making the final stop. The use of the current relays permits automatic regulation of dynamic braking effort since it is only necessary that the operator set up the braking circuit by moving the braking control to the proper braking notch. In the case of the holding brake, the operator is then free to devote his attention to the proper application of air brakes in order to maintain a constant speed down-grade. In the case of the decelerating brake the braking control can be moved to the final braking notch and the relays will automatically cause the proper reduction in braking resistance to give a uniform rate of deceleration.

## Emergency Dynamic Braking

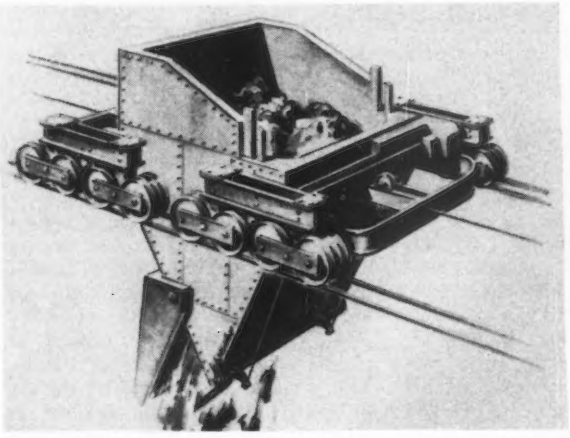
In addition to normal braking service, the dynamic brake control system can be adapted to provide certain emergency functions. In some cases it is desirable to immediately produce braking of a train upon loss of trolley power, power being lost because of trolley dewirement or other causes. This condition can be met by the use of spring-closed braking switches as shown in Fig. 5. Under normal conditions of running and braking these switches are controlled from the master controller. Upon loss of trolley voltage a no voltage relay in the control circuit causes all other switches to open and also removes power from the holding coils of the spring closed switches. These switches are then closed by the springs and in closing set up a braking circuit through a dynamic braking resistor as shown.

The value of resistance under this condition must be a compromise of a number of factors such as maximum speed, grade, load of train and maximum braking effort. The value of resistance must be such that if braking is applied at maximum speed the commutation limit of the motors is not exceeded. Also the retardation rate produced must be within the limit which would avoid the operator or triprider being thrown from the locomotive when braking is initiated.

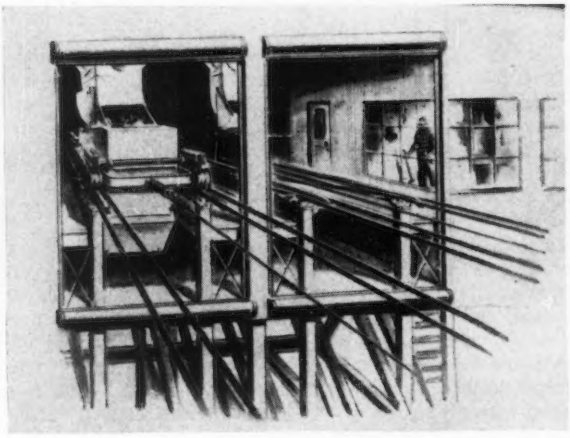
(*Concluded on p 98*)



**THE PROBLEM** for northern iron mines is how to stockpile ore cheaply in winter, when it can't be shipped south. Here is the Peterson mine's solution, an aerial tram, the operation of which will be of interest to mines stockpiling anywhere.



**THE CARS** carry 170 cu ft (10 long tons), travel at 1500 fpm.



**THE HOIST** averages 600 tons per hr; pile holds million tons.

# How An Aerial Tram Will Stockpile Ore

STOCKPILING OF IRON ORE at the Peterson mine on Northern Michigan's Gogebic Range will be handled by aerial tramway. It will be the first such installation for winter stockpiling in the Iron Country.

Assembled from the holdings of four old mines near Bessemer, Mich., the Peterson is owned by Puritan Mining Co., in which Bethlehem Steel Corp. and Youngstown Sheet & Tube Co. are participating jointly. Pickands, Mather & Co. operates the property for these two stockholders. (See "A New Mine for Michigan's Gogebic Range," *E&MJ*, September 1953, p 76.)

Ore from the Peterson "A" shaft (present depth 3736 ft) will go to stockpile in the two tramcars shown above, each holding 170 cu ft (10 long tons) of ore. Each car rides on four 2-in. track cables, at 1500 fpm. They are fitted with 32 roller-bearing steel wheels on each car.

Haul rope is a 1¼-in. conventional hoisting rope. The drive wheel is 12 ft in diameter and is rubber-lined. It is driven through herringbone gears by a 300-hp wound-rotor induction motor. The tram is protected against overspeed and over-travel by devices of the Lilly type.

The tramway will be a single-span unit, and the distance from the loading terminal to the tail towers is 1500 ft. The loading terminal is 85 ft high, the tail towers are 165 ft high.

Maximum sag in the track cables at the center of the tramway will be 40 ft. The stockpile of ore will be 70 ft high throughout its length, and will provide storage for 1-million long tons of ore, figured at 15 cu ft per ton, a conservative estimate.

Overall capacity of the tramway will be 600 long tons per hr. The capacity at the middle of the pile will be 754 tons per hr, and at the end of the pile, it is 486 tons per hour.

The tramway for the Peterson mine was designed, fabricated, and erected by Interstate Equipment Division of Yara Engineering Co., Elizabeth, N. J.

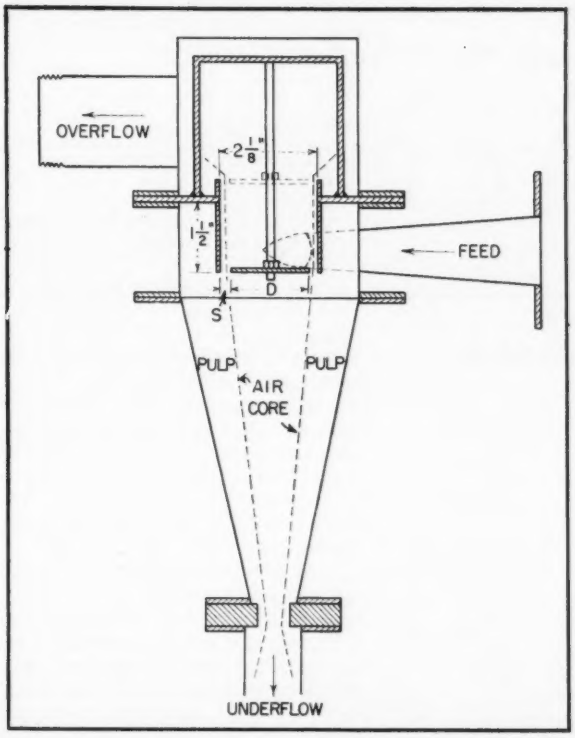



**FIG. 1. . . FIRST TESTS** were run with conventional two-product 4-in. cyclone, shown above. Tests (see text) confirmed pulp bulk flows as thin film inside the vortex finder.

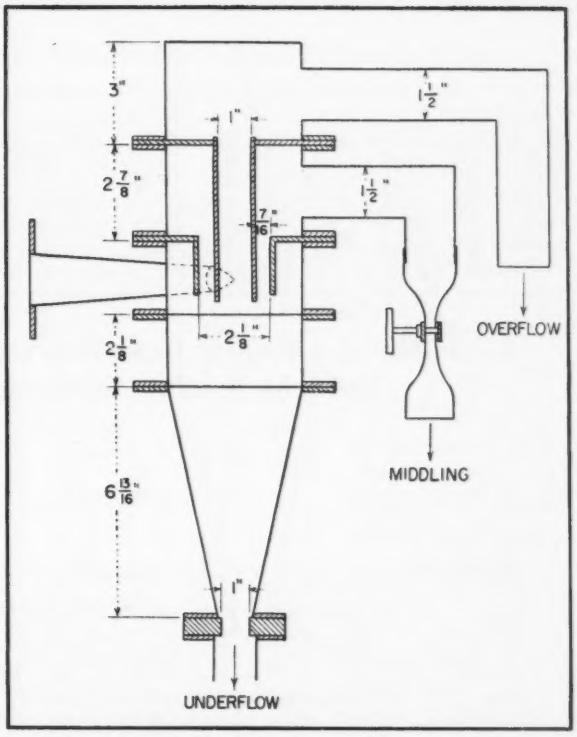



**FIG. 2. . . FINAL JOB** included second vortex finder built around first one, thus providing means for drawing off middling. Adjusting size of finders provides needed control.

# How A Three-Product Cyclone Helps Two-Product Separation

E. C. HERKENHOFF,
Pickands, Mather & Co.,
Hibbing, Minn.

THE OBJECT OF THIS PAPER is to describe the three-product cyclone separator which was developed in the Hibbing Laboratory of Pickands, Mather & Co. and to present data on the performance of this cyclone when classifying ore pulps and when making ore separations by gravity difference.

So far as is known, literature contains no information on the making of three-products from a cyclone employed for ore separations. Some prior classification work has been done with dust separations and paper pulp suspensions but using vessels or separators generally different in shape, different in principal features and in action. The recently announced Krebs Cyclone, employing a combination of a cylinder and cone, produces three fractions in classification work but was developed as a two-stage classifier.

At the present time, it is believed that the advantages offered by a three-product cyclone separator are not so much the ability to remove a middling but as a means of controlling the separation within certain limits when making a two-product separation. That is, with a three-product cyclone, the classification split or ore separation can be controlled externally, without changing the feed pulp density, medium density or other regulating controls. What is provided is, in effect, an adjustable vortex finder, controlled from without the cyclone and having no internal moving parts.

One method of controlling the classification split in a conventional two-product cyclone is by the use of an adjustable underflow or apex orifice, such as a rubber "tire" valve or sphincter valve inflatable by compressed air or water. This mechanical

## Table No. 1—Pulp Flow Through Vortex Finder Equipped as in Fig. 1

| Test No. | Feed Lb. press | Feed GPM | Feed Grav. | Overflow Grav. | Overflow % wt. pulp | Underflow Grav. | Underflow % Wt. pulp | Disc. Dia | Disc. Position | Disc. S |
|---|---|---|---|---|---|---|---|---|---|---|
| 13-M-B | 23 | 27.6 | 2.32 | 2.29 | 90.72 | 2.71 | 9.28 | — | None | — |
| 15-M | 21 | 28.1 | 2.32 | 2.29 | 91.79 | 2.71 | 8.21 | 1 5/16" | Lower | 13/32" |
| 16-M | 21 | 27.0 | 2.33½ | 2.30 | 90.72 | 2.72 | 9.28 | 1 5/16" | Upper | 13/32" |
| 18-M | 21 | 25.9 | 2.32 | 2.28 | 86.94 | 2.43 | 13.06 | 1 3/4" | Lower | 3/16" |
| 17-M | 21 | 26.0 | 2.32 | 2.27 | 85.37 | 2.73 | 14.63 | 1 3/4" | Upper | 3/16" |

Note; In all tests, the apex was 11/16 in.

## Table No. 2—Medium Flows in Three-Product Cyclone

| Test No. | Feed Lb. press | Feed GPM | Feed Grav. | Overflow Grav. | Overflow % wt. pulp | Middling Grav. | Middling % wt pulp | Underflow Grav. | Underflow % wt pulp | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 25-M | 23 | 24.5 | 2.33 | 2.24 | 76.56 | None | | 2.62 | 23.44 | Middling take-off closed |
| 24-M | 23 | 25.7 | 2.33 | 2.20 | 45.41 | 2.42 | 36.17 | 2.62 | 18.42 | Middling partly open. |
| 26-M | 21 | 26.4 | 2.34 | None | | 2.26 | 82.67 | 2.63 | 17.33 | Middling wide open. |
| 39-M | 24 | 20.0 | 2.32 | 2.24 | 80.11 | — | — | 2.71 | 19.89 | Two product cyclone 1 in. vortex finder.* |
| 13-MB | 23 | 27.6 | 2.32 | 2.29 | 90.72 | — | — | 2.71 | 9.28 | 2⅛ in. vortex finder.* |

*Cyclone did not have an auxiliary cylindrical section as shown in Fig. 1.

## Table No. 3—Painty Lean Ore Separation in Three Product Cyclone

| Test No. | Product | Flow splits % wt. ore +medium | Flow splits % wt. dry ore | Flow splits % wt. medium | Ore separation Assay % iron | Ore separation Assay % silica | Ore separation % distrib. of iron | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | Feed | 100.00 | 100.00 | 100.00 | 49.05 | 17.48 | 100.00 | |
| | Overflow | 65.28 | 18.80 | 70.73 | 31.21 | 43.20 | 11.96 | Middling take-off was closed. |
| | Middling | — | — | — | — | — | — | |
| | Underflow | 34.72 | 81.20 | 29.27 | 53.18 | 11.52 | 88.04 | |
| 2 | Feed | 100.00 | 100.00 | 100.00 | 49.35 | 16.48 | 100.00 | |
| | Overflow | 43.66 | 13.01 | 47.79 | 31.45 | 41.48 | 8.29 | Middling take-off was ⅛ |
| | Middling | 27.56 | 9.96 | 29.93 | 36.36 | 35.15 | 7.34 | |
| | Underflow | 28.78 | 77.03 | 22.28 | 54.06 | 9.84 | 84.37 | open. |
| 3 | Feed | 100.00 | 100.00 | 100.00 | 49.22 | 17.24 | 100.00 | |
| | Overflow | 26.98 | 5.59 | 29.49 | 28.48 | 45.84 | 3.23 | Middling take-off was ⅔ |
| | Middling | 47.09 | 17.60 | 50.55 | 35.40 | 38.09 | 12.66 | |
| | Underflow | 25.93 | 76.81 | 19.96 | 53.90 | 10.26 | 84.11 | open. |
| 4 | Feed | 100.00 | 100.00 | 100.00 | 48.75 | 17.60 | 100.00 | |
| | Overflow | — | — | — | — | — | — | Middling take-off was fully |
| | Middling | 79.26 | 43.41 | 84.15 | 41.07 | 28.16 | 36.57 | |
| | Underflow | 20.74 | 56.59 | 15.85 | 54.65 | 9.50 | 63.43 | open. |

method, coupled with a vacuum control, such as developed by Wright and Weaver,[1] provides an ingenious regulation of apex discharge density and, indirectly, of the overflow product. However, direct control over the overflow orifice opening has heretofore been limited to shutting down the cyclone and changing the size of the actual vortex finder.

The work which led to the development of the three-product cyclone provides additional information on flow paths of pulps in cyclones. The lead developed from a study of the flow path of pulps discharging through the vortex finder of a conventional 4-in. cyclone separator used for ore separations. Various tests with vortex finders of different diameters, described elsewhere,[2,3] indicated that the flow occurred as a thin film on the inner surface of the vortex finder. This was verified in tests which are described below.

### Pulp Flow Through Vortex Finder

The apparatus employed to study the pulp flow through the vortex finder or overflow outlet is shown in Fig. 1. Essentially, it consists of a 4-in. cyclone with a 2⅛-in. dia vortex finder. A threaded ¼-in. rod, centered in the vortex finder and rigidly mounted to a yoke attached to the top of the vortex finder, extended down into the cylindrical feed inlet section to a level just below the lower end of the vortex finder. Discs, ⅛-in. in thickness and having outside diameters of 1 5/16-in. and 1¾-in., respectively, could be threaded onto the rod and locked into place by a lock nut. The position of the disc could be adjusted by running it up and down on the threaded rod.

The two sizes of discs left annular spaces between their rim and the inside of the vortex finder of 13/32-in. and 3/16-in. wide, respectively.

The cyclone separator first was fed a medium consisting of magnetite and water, and no disc was placed on the threaded rod. The volumes of pulp and the weight splits were recorded when feeding the cyclone at a normal rate.

The discs then were placed on the threaded rod, first in the lower position, flush with the lower end of the vortex finder, then in the upper position, flush with the upper end of the vortex finder. Pulp splits and flow data again were recorded for comparison with the reference test. These are recorded in Table 1.

Table 1 shows that there was no interference effect from the 1 5/16-in. dia disc. However, the 1¾-in. dia disc did affect the flow of overflow pulp, both in the upper and lower positions. Thus it may be concluded that the overflow pulp leaving the cyclone chamber is spread in a thin film on the inner surface of the vortex finder.

With the coarsest particles at the outer walls (as evidenced by a pronounced wear path at the outer ¼-in. wide strip of any vortex finder plate), and the finer particles in the inner portion of the rotating core of pulp, it was apparent that somewhere between there is a "middling" zone and that the pulp from that zone might be drawn off by placing another vortex finder around the inner one. A new assembly incorporating the concentric vortex finders was built and is described below.

### Three-Product Cyclone

A 4-in. dia cyclone having a middling take-off was built as shown in Fig. 2. This cyclone was fed by the same pump and sump arrangement as used for the standard two-product cyclone. In the initial tests, a 2⅛-in. high auxiliary cylindrical section was inserted between the conical and feed inlet sections as illustrated in Fig. 2.

Basically, the three-product cyclone consists of an inner vortex finder, which discharges into a conventional overflow cap, and an outer, larger, concentric vortex finder which discharges into a middling chamber having an outlet through a conduit equipped with a pinch clamp or valve. When this middling conduit is completely closed, all the cyclone overflow is through the inner, smaller vortex finder; when fully open, all the cyclone overflow is through the outer larger vortex finder. By restricting the flow from the middling conduit, the discharge of the overflow and the middling products can be varied from 0—100% and 100—0%, respectively. Table 2 contains data on the flow splits of magnetite medium in the three-product cyclone. It can be seen that the quantity of underflow could be

varied from 17.3 to 23.4% by weight and that the specific gravity of the overflow and middling discharges varied from 2.20 to 2.42. The capacity of the cyclone increased as the flow from the middling take-off increased. For rough comparison, data on the flow splits from a two-product cyclone not having an auxiliary cylindrical section but equipped with vortex finders of 1-in. and 2⅛-in. dia are included.

Bearing in mind that ore separations may be controlled largely by the cyclone overflow gravity, it is apparent that the three-product cyclone should provide a strictly mechanical control over cyclone ore separations.

It is important to consider that there are no internal moving parts in the three-product cyclone. Ore separations usually involve severe cyclone wear and it is highly important to design the cyclone accordingly. With the three-product cyclone shown in Fig. 2, both the inner and outer vortex finders and supporting discs can be readily replaced or easily lined with abrasion-protective coverings.

The dia of the two vortex finders can be varied over a considerable range, depending upon the separations desired. Where coarse solids are to be separated, the gap between the inner and outer vortex finders must of course be sufficient in width to allow passage of such particles. Obviously, a very wide range of control can be obtained where the inner opening is quite small and the outer is relatively large.

## Lean Ore Separations In The Three-Product Cyclone

The control over lean iron ore separations, by the use of a three-product cyclone separator, is illustrated by the results shown in Tables 3, 4, and 5.

The 4-in. dia cyclone shown in Fig. 2 was used for the separation. As in tests with conventional two-product cyclone separations, the circuit was charged with a magnetite medium (S. G. = 2.32 in Tables 3 and 5 and 2.42 in Table 4) and a 20 lb charge of —¼-in. +80 mesh lean ore was added. Samples of the cyclone products were taken when operating with various flows of pulp from the middling take-off, as regulated by a pinch-clamp.

Data in Table 3 refer to the pulp flow splits and metallurgical results obtained in the separation of a lean, painty iron ore. It can be seen from Table 3 that without any change in cyclone dimensions or in gravity of the feed medium, the weight recovery could be varied from 56.6 to 81.2%, and the grade of concentrate from 9.5 to 11.5% $SiO_2$.

In the case of the jig tailings sam-

### Table No. 4—Concentration of Jig Tailings in Three Product Cyclone

| Test No. | Product | Flow splits: % wt. ore +medium | Flow splits: % wt. dry ore | Flow splits: % wt. medium | Ore separation: Assay % iron | Ore separation: Assay % silica | Ore separation: % distrib. of iron | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | Feed | 100.00 | 100.00 | 100.00 | 33.93 | 43.25 | 100.00 | |
| | Overflow | 70.52 | 49.46 | 73.20 | 17.87 | — | 26.05 | Middling take-off was closed. |
| | Middling | — | — | — | — | — | — | |
| | Underflow | 29.48 | 50.54 | 26.80 | 49.64 | 20.43 | 73.95 | |
| 2 | Feed | 100.00 | 100.00 | 100.00 | 32.75 | 43.25 | 100.00 | |
| | Overflow | 30.11 | 19.88 | 31.29 | 18.40 | — | 11.17 | Middling take-off partly |
| | Middling | 50.95 | 43.81 | 51.77 | 24.37 | — | 32.60 | |
| | Underflow | 18.94 | 36.31 | 16.94 | 50.71 | 16.40 | 56.23 | open. |
| 3 | Feed | 100.00 | 100.00 | 100.00 | 33.18 | 43.25 | 100.00 | |
| | Overflow | — | — | — | — | — | — | Middling take-off fully open. |
| | Middling | 89.98 | 81.20 | 91.07 | 28.36 | — | 69.40 | |
| | Underflow | 10.02 | 18.80 | 8.93 | 54.01 | 12.39 | 30.60 | |

### Table No. 5—Siliceous Lean Ore Separation in Three Product Cyclone

| Test No. | Product | Flow splits: % wt. ore +medium | Flow splits: % wt. dry ore | Flow splits: % wt. medium | Ore separation: Assay % iron | Ore separation: Assay % silica | Ore separation: % distrib. of iron | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | Feed | 100.00 | 100.00 | 100.00 | 47.76 | — | 100.00 | |
| | Overflow | — | — | — | — | — | — | Middling take-off fully open. |
| | Middling | 75.61 | 36.56 | 82.50 | 27.35 | — | 20.94 | |
| | Underflow | 24.39 | 63.44 | 17.50 | 59.52 | 9.13 | 79.06 | |
| 2 | Feed | 100.00 | 100.00 | 100.00 | 47.54 | — | 100.00 | |
| | Overflow | 25.45 | 8.60 | 28.20 | 13.06 | — | 2.36 | Middling take-off partly closed. |
| | Middling | 46.93 | 18.02 | 51.67 | 19.84 | — | 7.53 | |
| | Underflow | 27.62 | 73.38 | 20.13 | 58.38 | 10.45 | 90.11 | |
| 3 | Feed | 100.00 | 100.00 | 100.00 | 46.37 | — | 100.00 | |
| | Overflow | 61.28 | 20.94 | 68.63 | 14.70 | — | 6.64 | Middling take-off was closed. |
| | Middling | — | — | — | — | — | — | |
| | Underflow | 38.72 | 79.06 | 31.37 | 56.91 | 12.44 | 93.36 | |

### Table No. 6—Classification of Taconite Pulp

| Test No. | Product | Gal. pulp per min. | Pulp density % solids | Tons solids per hr. | Solids % wt. distrib. | Remarks |
|---|---|---|---|---|---|---|
| 1 | Feed | 24.90 | 65.57 | 7.09 | 100.00 | |
| | Overflow | — | — | — | — | Middling take-off fully open. |
| | Middling | 13.50 | 46.31 | 2.15 | 30.30 | |
| | Underflow | 11.19 | 79.75 | 4.95 | 69.70 | |
| 2 | Feed | 23.14 | 65.57 | 6.62 | 100.00 | |
| | Overflow | 3.78 | 28.39 | 0.30 | 4.60 | Middling take-off partly closed. |
| | Middling | 7.79 | 44.45 | 1.18 | 17.77 | |
| | Underflow | 11.25 | 80.84 | 5.14 | 77.63 | |
| | Middling+Overflow | 11.57 | 39.83 | 1.48 | 23.37 | |
| 3 | Feed | 22.73 | 65.90 | 6.60 | 100.00 | |
| | Overflow | 9.22 | 30.41 | 0.80 | 12.15 | Middling take-off mostly closed. |
| | Middling | 1.74 | 50.26 | 0.33 | 4.98 | |
| | Underflow | 11.42 | 82.13 | 5.47 | 82.87 | |
| | Middling+Overflow | 10.96 | 34.34 | 1.13 | 17.13 | |
| 4 | Feed | 22.89 | 65.90 | 6.56 | 100.00 | |
| | Overflow | 10.91 | 33.63 | 1.11 | 16.86 | Middling take-off fully closed. |
| | Middling | — | — | — | — | |
| | Underflow | 11.65 | 80.94 | 5.46 | 83.14 | |

Cyclone: Overflow vortex = 1 in. Middling vortex = 2⅛ in. Apex = 15/16 in. Feed Pressure = 9 to 11 psi.

## Table No. 6-A—Screen Analyses of Cyclone Products Per Cent Weight

| Mesh | Feed | Test 1 O'flow | Test 1 Midd. | Test 1 U'flow | Test 2 O'flow | Test 2 Midd. | Test 2 U'flow | Test 3 O'flow | Test 3 Midd. | Test 3 U'flow | Test 4 O'flow | Test 4 Midd. | Test 4 U'flow |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| + 8 | 0.81 | | | 0.91 | | | 1.35 | | | 0.57 | | | 0.85 |
| + 10 | 1.22 | | | 3.07 | | | 3.39 | | | 2.07 | | | 1.71 |
| + 14 | 3.58 | | | 4.65 | | | 5.74 | | | 4.36 | | | 3.28 |
| + 20 | 3.26 | | | 4.73 | | | 4.59 | | | 3.68 | | | 3.35 |
| + 28 | 3.91 | | | 5.84 | | | 5.17 | | | 4.25 | | | 4.00 |
| + 35 | 4.07 | | 0.35 | 6.65 | | 0.16 | 5.24 | | 0.21 | 4.88 | | | 4.86 |
| + 48 | 5.54 | | 0.96 | 8.02 | | 0.16 | 6.63 | | 0.53 | 6.28 | 0.26 | | 6.30 |
| + 65 | 6.60 | | 2.52 | 9.04 | | 0.87 | 8.10 | | 1.40 | 7.73 | 0.52 | | 7.55 |
| +100 | 8.88 | | 5.48 | 11.00 | 0.14 | 3.00 | 10.48 | 0.51 | 3.74 | 10.48 | 0.65 | | 10.43 |
| +150 | 9.77 | | 8.00 | 11.21 | 0.28 | 5.22 | 11.41 | 0.61 | 6.28 | 11.93 | 0.91 | | 11.94 |
| +200 | 9.85 | | 10.00 | 10.32 | 0.29 | 7.91 | 11.18 | 1.32 | 8.96 | 11.87 | 2.47 | | 11.61 |
| +325 | 12.79 | | 17.65 | 10.87 | 2.99 | 15.88 | 12.57 | 5.09 | 17.11 | 14.94 | 6.76 | | 15.55 |
| −325 | 29.72 | | 55.04 | 13.69 | 96.30 | 66.80 | 14.15 | 92.47 | 61.77 | 16.96 | 88.43 | | 18.57 |
| Total | 100.00 | None | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | None | 100.00 |
| Solids % wt distrib | 100.00 | — | 30.30 | 69.70 | 4.60 | 17.77 | 77.63 | 12.15 | 4.98 | 82.87 | 16.86 | — | 83.14 |

## Table No. 7—Classification of Washer Tailings

| Test No. | Product | Gal. pulp per min. | Pulp density % solids | Tons solids per hr. | Solids % wt. distrib. | Remarks |
|---|---|---|---|---|---|---|
| 1 | Feed | 24.31 | 30.68 | 2.26 | 100.00 | Middling take-off closed. |
| | Overflow | 18.33 | 10.61 | 0.47 | 20.80 | |
| | Middling | — | — | — | — | |
| | Underflow | 5.98 | 70.12 | 1.79 | 79.20 | |
| 2 | Feed | 27.06 | 30.68 | 2.42 | 100.00 | Middling take-off partly open. |
| | Overflow | 11.88 | 10.57 | 0.30 | 12.39 | |
| | Middling | 9.58 | 18.12 | 0.44 | 18.27 | |
| | Underflow | 5.60 | 70.25 | 1.68 | 69.34 | |
| 3 | Feed | 29.11 | 30.68 | 2.45 | 100.00 | Middling take-off fully open. |
| | Overflow | — | — | — | — | |
| | Middling | 23.91 | 14.99 | 0.89 | 36.52 | |
| | Underflow | 5.20 | 69.83 | 1.56 | 63.48 | |

Cyclone: Overflow vortex = 1 in. Feed Pressure = 12 to 14 psi.
Middling vortex = 2⅛ in.
Apex = 15/16 in.

## Table No. 7-A—Screen Analyses of Cyclone Products

| Mesh | Feed | Test 1 O'Flow | Test 1 U'Flow | Test 2 O'Flow | Test 2 Midd. | Test 2 U'Flow | Test 3 O'Flow | Test 3 Midd. | Test 3 U'Flow |
|---|---|---|---|---|---|---|---|---|---|
| + 28 | .05 | | .05 | | — | .04 | | — | .06 |
| + 35 | .15 | | .15 | | — | .14 | | .15 | .18 |
| + 48 | 0.84 | — | 0.81 | — | .08 | 0.80 | | .08 | 1.03 |
| + 65 | 2.88 | — | 3.11 | 0.17 | .07 | 3.18 | | .10 | 4.01 |
| +100 | 8.71 | 0.20 | 10.56 | 0.06 | 0.33 | 11.52 | | 0.55 | 13.52 |
| +150 | 15.23 | 0.67 | 19.48 | 0.10 | 1.58 | 22.21 | | 2.42 | 22.82 |
| +200 | 19.06 | 2.80 | 25.02 | 0.59 | 5.47 | 25.99 | | 6.49 | 24.66 |
| +325 | 20.70 | 8.08 | 23.03 | 4.43 | 23.69 | 21.78 | | 17.52 | 20.05 |
| −325 | 32.38 | 88.25 | 17.79 | 94.65 | 68.78 | 14.34 | | 72.69 | 13.67 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | None | 100.00 | 100.00 |
| Solids % wt. distrib | 100.00 | 20.80 | 79.20 | 12.39 | 18.27 | 69.34 | — | 36.52 | 63.48 |

ple, the results given in Table 4 show that the weight recovery was varied from 18.8 to 50.4% while the grade of concentrate changed from 12.4 to 20.4% $SiO_2$.

The control over the separation of the siliceous lean ore is illustrated in Table 5. Note that the grade of product could be varied from 9.1 to 12.4% $SiO_2$.

The advantages of this simple mechanical control over ore separations are apparent, particularly when treating lean ores which vary frequently in grade, structure and degree of liberation.

When the middling take-off conduit is completely closed, there is a pressure of approximately 3 to 5 psi in the middling chamber when the inlet feed nozzle pressure is 15 to 20 psi.

### Classification of Ore Pulps In The Three-Product Cyclone

The classification of ore pulps is a highly important and fast growing use for cyclones and it has been found that the classification point can be controlled over a certain range by use of the three-product cyclone.

Examples of results obtained in classifying a taconite ore pulp and a washer tailing are given in Tables 6, 6-A, 7, and 7-A.

In each case, the 4-in. cyclone of Fig. 2 was used; the sizes of the various orifices are shown in Tables 6 and 7, together with data on flow splits and pulp densities. Tables 6-A and 7-A contain screen analyses of the test products.

Table 6 shows that the weight distribution of solids in the taconite pulp was varied from 16.9 to 30.3% in the combined overflow-middling products while the structure of said products varied from extremes of 96.3 to 55.0% minus 325 mesh. Middling products of varying structures and pulp densities could be isolated if desired. These ranges were obtained without any adjustment in pulp density of the cyclone feed pulp, feed pressure or orifice openings.

The classification of a washer tailing, conducted at a feed gravity of 30.7% solids, yielded results shown in Tables 7 and 7-A. Structures of the products reveal that when making only two products, the overflow or middling ranged from 88.2 to 72.7% −325 mesh and 0.87 to 3.10% +150 mesh.

Tests have been conducted on taconite ore pulps with a 10-in. dia three-

product cyclone and the results check those reported in Tables 6 and 6-A.

## Summary and Conclusions

A three-product cyclone classifier and separator has been developed which can make overflow, middling and underflow products. When operated as a two-product cyclone, it provides a simple, positive control over the ore separation or classification point without resorting to the usual controls of pulp density, pressure, medium density and change of orifice openings.

Data have been presented which show the range of control achieved over ore separations when employing media, and over the classification splits when employed for such uses.

The three-product cyclone is of simple construction, easily wear-proofed and compact. Control of the separation is external and can be varied without shutting down the unit to change the set of orifice openings.

NOTE: *Patent protection has been applied for.*

## References


[1] U. S. Patent No. 2,648,433, issued Aug. 11, 1953.

[2] *Engineering and Mining Journal*, Vol. 154, No. 8, August 1953.

[3] "The Hydrocyclone, Its Application and Its Explanation," F. J. Fontein and C. Dijksman, Imperial College of Science and Technology, London, September 1952.


## Discovery at Eureka

(*Continued from p. 81*)

tionary pumps discharge through a 10-in. pipe column installed in one of the shaft compartments and extending to the surface. Water rings are installed in the shaft at points needed, and in bad ground concrete bearer sets replace standard timber sets every 150 ft.

The wooden headframe over the shaft is 50 ft high, and equipment available in the hoist house proper includes a 150-hp double-drum hoist and two air compressors with a total air output of 800 cfm. Electric power for the hoist, compressors, pumps, and other shaft auxiliaries is furnished by a 1000-kw Worthington diesel unit operated in the central Fad shaft power plant.

During the past year the company staked 39 additional claims contiguous to the north and west to protect extensions of the new discoveries described, even though the area lies well within the original lease boundaries. The Eureka operations are an outstanding example of a management's perseverance and dogged determination to carry on in the face of seemingly endless problems and setbacks. G. W. Mitchell, vice president and general manager, has guided the project since its inception.

## Locomotive Brakes

(*Continued from p. 93*)

On some haulage systems it is desirable from an operating standpoint not to exceed a maximum running speed. To prevent operators from exceeding this limit an overspeed relay is used in conjunction with the dynamic braking circuit. When the limiting speed is reached the overspeed relay causes the running switches to open and the dynamic braking switches to close, automatically braking the train. The train must be brought to a full stop before a reset switch permits reapplication of running power. In some cases this reset switch is locked and cannot be operated until a key is obtained from the mine foreman or other authorized personnel. This permits a definite record of overspeed operation that can be charged to the operator. As a result operating speeds are held within safe limits.

### Automatic Selective Current Limit Dynamic Braking

It is possible to automatically apply dynamic braking to a locomotive without any required manipulation of the control lever by the operator. By the use of selective current limit relays the braking rate and speeds can be automatically controlled over a given section of grade. Control of the locomotive can be taken out of the hands of the operator. After the grade section has been traversed, control of the locomotive is returned to the operator.

*Detailed descriptions of locomotive braking installations at International Minerals & Chemical Corp., Carlsbad, N. M., and Phelps Dodge Corp., Morenci, Ariz., will follow in subsequent articles.*

# New Books

**The Fundamentals of Electric Log Interpretation.** By M. R. J. Wyllie, head of Petrophysics Division, Gulf Research & Development Co., Pittsburgh, Pa. This text explains the underlying philosophy of electric log interpretation to enable the non-specialist to understand basic log interpretation principles of this subject. Published by Academic Press, Inc., 125 East 23 St., New York 10, N. Y. Pp 126. Price $3.60

**Compressed Air Handbook. Second Edition. By the Compressed Air and Gas Institute.** The second edition contains hundreds of new illustrations, charts and tables including the latest developments in compressors and compressed air tools. This book will prove very useful in your mine library. Published by McGraw-Hill Book Co., 330 West 42 St., New York 36, N. Y.. Pp 390. Price $8

**Introduction to Atomic Physics.** New Second Edition. By Otto Oldenberg, Professor of Physics, Harvard University. This thoroughly revised second edition has been prepared for majors and nonmajors who have taken a general one-year course in physics. New subjects treated in the revised edition include cosmic rays, and solid state physics. For the mining man with a studious bent, whose college physics has been outmoded in part by the atomic age, this text offers an opportunity to catch up a bit on fusion, fission, transmutation of elements, etc. Published by McGraw-Hill Book Co., 330 West 42 St., New York 36, N. Y. Pp 421. Price $6

**Les Mines de Fer Francaises.** A statistical and historical account of France's energetic expansion program in iron ore production which resulted in a total output of 43.5-million tons of iron ore in 1953 after an accelerated mechanization program started in 1947. Published in French by Hauts-Fourneaux de Saulines, Jean Raty & Cie., 8 Place d' Iena, Paris, 16E, France. Pp 156.

**Bibliography of the Geology and Mineral Resources of Arizona 1939-1952.** By John W. Anthony, Eldred D. Wilson and Richard T. Moore. Bulletin No. 161. Published by the U. of Arizona, Tucson. Price 45¢.

## *Capital Spending Plans for 1955 . . .*

# Here is Good News About Business Prospects

In 1955, American industry is now planning to spend within 5 per cent of the amount it is spending this year on new plant and equipment. This is the tensely awaited result of a check-up just completed by the McGraw-Hill Department of Economics.

Hundreds of companies, by far the largest number in the eight-year history of these McGraw-Hill surveys, cooperated in the check-up. Combined, they represent 29 per cent of all industrial employment and over 60 per cent of employment in the industries where capital investment is highest. Such a broad cross section constitutes a reliable gauge of the plans of industry as a whole.

**PLANS FOR CAPITAL INVESTMENT**

| | MILLIONS OF DOLLARS | | | Percent Change 1954-1955 |
|---|---|---|---|---|
| | 1953 ACTUAL* | 1954 ESTIMATED* | 1955 PLANNED | |
| All Manufacturing | $10,026 | $ 9,249 | $ 8,598 | −7% |
| Petroleum Industry† | 4,600 | 4,875 | 4,920 | +1 |
| Mining | 506 | 380 | 311 | −18 |
| Railroads | 1,312 | 851 | 769 | −10 |
| Other Transportation and Communications | 2,954 | 2,922 | 2,640 | −10 |
| Electric and Gas Utilities | 4,548 | 4,274 | 4,206 | −2 |
| ALL INDUSTRY | 23,271 | 21,784 | 20,727 | −5 |

*United States Department of Commerce; Chase National Bank; McGraw-Hill Department of Economics

†Petroleum refining, included under both "All Manufacturing" and "Petroleum Industry," is included only once in the total

What is the meaning of these plans, detailed by the table below, for capital investment next year? Is it good or bad news, so far as it concerns the prospect of continuing prosperity? It is to this crucial question that this editorial is addressed.

## Key to Prosperity

**It is not only good but very important business news that American industry plans to spend in 1955 almost as much for new plant and equipment as it is spending this year.** The reason it is important is that a high level of activity in the capital goods industries is universally recognized as a particularly potent ingredient of prosperity for the nation as a whole. A dollar spent for capital goods is spent again and again for wages and materials. Its stimulating effects, called by economists multiplying effects, move through the economy in much the same way that a pebble tossed into a pond creates a widening circle of ripples. This is one reason why there is such intense business interest in the surveys of plans for capital investment.

Here are the principal reasons why the results of the McGraw-Hill survey are a good omen for continuing prosperity:

**1. American industry is demonstrating that it does not need the stimulus of war-created shortages, or a rearmament boom, in order to maintain a very high level of capital investment.**

The slight decrease now planned for 1955 will still maintain a level only about 11 percent below the all-time peak attained in 1953 under the stimulus of a defense expansion boom.

**2. Capital investment promises not merely to stabilize at a high level, but actually to increase as 1955 goes on and thus give renewed stimulus to business.**

The level of investment now planned for 1955 by *industry* — manufacturing, petroleum, mining, transportation, communications and utilities — is within 5 per cent of 1954. Contract awards for *commercial* construction — stores, office buildings, warehouses and other service establishments — as compiled by the McGraw-Hill publication ENGINEERING NEWS-RECORD, indicate a substantial increase in 1955. Thus total capital expenditures by *all business* may be very close to this year's total.

Actually, in the fourth quarter of 1954, business capital expenditures, as reported to the U. S. Department of Commerce, are down about 2.5 per cent from the average for the year as a whole. So there is a good chance that during 1955 the annual rate of capital investment will rise above this present level.

## Effect of Tax Changes

The plans reported by the McGraw-Hill survey are preliminary plans, reported at the beginning of the period of business budgeting for 1955. As budgets are completed, new projects may bring the total expenditure that is planned even closer to this year's figure and thus make an even greater contribution to continuing prosperity.

But it also cannot be too strongly emphasized that these are plans; they are not accomplished investments. As such they have the vulnerability to changed conditions that characterize any plans.

There is some indication in the results of the McGraw-Hill check-up that one change in conditions recently made by the United States government has had an important stimulating effect on plans for business investment next year. It is a liberalization of the allowances for depreciation. Apparently encouraged by this provision, most of the smaller companies are planning to maintain or increase their purchases of new equipment next year, whereas during the past three years their expenditures have been declining. This is obviously a development that strengthens our economy.

A government insensitive to the key importance of capital investment by business, both in providing prosperity and in raising our standard of living, might easily destroy the present plans. One of the easiest and surest means to do this is excessive taxation of business profits which are the key ingredient of business investment. Whether the extraordinarily constructive program recently enacted by the federal government in the field of business taxation can be sustained remains to be seen. **If it can be sustained, the remarkably cheering plans of business for capital investment in 1955 can readily become firm foundations for a continuing prosperity.**

*This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.*

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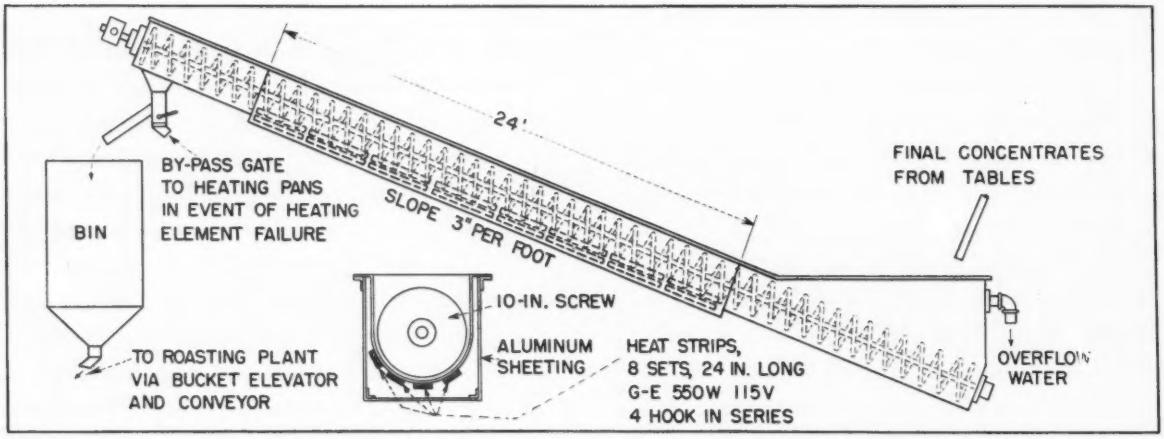
Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

# OPERATING IDEAS




## Strip Heater Dryer for Tungsten Concentrates

THE PROCESS of drying tungsten concentrates at the 600-ton concentrator of Nevada Massachusetts Co., Tungsten, Nev., was speeded up with the unit illustrated here, accordlng to J. R. Caldwell, mill superintendent. Formerly, scheelite table concentrates were dried on a drying table which required periodic hoeing and considerable labor.

The trough-type heater with screw elevator has eliminated this work. Concentrates are dewatered and dried in a 24-ft section of shielding, square in cross-section and made of aluminum sheeting. Heat to dry the dewatered concentrates is supplied by 8 sets of GE 550-w, 115-v, 24-in. long heat strips. Each 4 units are hooked in series. The discharge spout at the upper end of the screw trough contains a by-pass gate to direct concentrates to the conventional drying table in event of failure of the heating elements.

## Core Drill Speeds Ilmenite Exploration

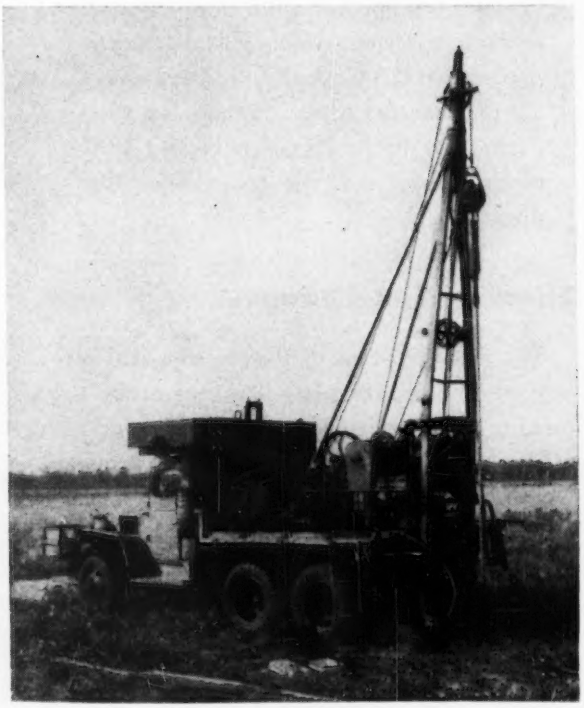
HUMPHREYS GOLD CORP. and the U. S. Bureau of Mines developed the unique core drilling unit shown at right for the exploration of watery ilmenite-bearing sands at the Du Pont Trail Ridge property, Starke, Fla.

The drill consists of a 200-lb hammer, elongated hollow drive head with hose connection inside, 10-ft length of ¾-in. jet pipe, and 1½-in. diamond-drill casing. The first length of jet pipe passes through and is welded to the hammer. The end of the pipe above the hammer is connected by a hose to a pump. The lower end of the pipe extends through the drive head to within 6 in. of the bottom of the first section of casing. As equal lengths of jet pipe and casing are added, the relative position of the lower ends of the two pipes is always the same.

As the casing is driven, water pumped through the jet pipe breaks up the rising core of the sand in the casing and carries it to the drive head where it discharges through the side opening and flows through a hose to the sample tub. Holes as deep at 75 ft are frequently drilled.

Samples of the material are obtained from each 5-ft section of ore. Drilling is continued until some formation such as clay or other material is encountered, or when panning indicates that the bottom of the ore has been passed.

Field experience has shown that a 3-man crew can average about 200 ft of hole per day with this equipment. During early development the drill-hole spacing was 330x 660 ft, but for operational purposes the holes are spaced on 100-ft centers.



# AUTOMATION*

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Instrumentation . . . centralized control . . . completely automatic operation . . . no fertilizer plant can be completely efficient unless it employs these three principles. And that's what you get with *every* Dorr-designed plant. Its complete mechanization and simplified control bring to the industry new conceptions for ease of operation, high production, lower manufacturing costs and quality product control.

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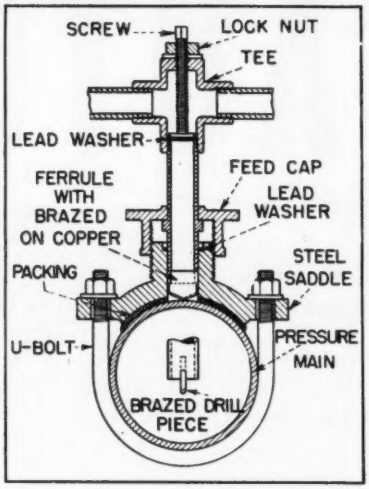
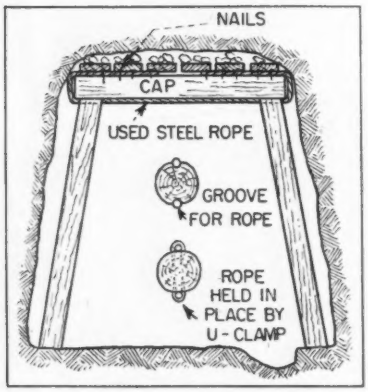
# How to Tap a High-Pressure Main




THIS DRILL ASSEMBLY is useful to tap and make connections to high-pressure air or water mains. Parts of the assembly include a steel saddle attached to the main by U-bolts, a revolving ferrule with brazed-on cutter or drill, a feed cap, and a T-piece for required pipe connections. After the steel saddle has been clamped on, the feed cap is advanced down the ferrule, while the T-piece is used to rotate the ferrule containing the cutter. The manner in which this assembly can be used to tap a high-pressure pipe line can best be understood by studying the drawing shown at left illustrating a cross-section of the various parts of equipment used to make steel saddle and clamp, and the T-piece used to rotate the drilling element entering the pipe. Steps in the pipe-tapping process are as follows:

Rotation of the ferrule and the feed cap simultaneously enables the drill to pierce the main, because the pressure is sealed by the lead washer inside the saddle. After drilling has been completed, it is only necessary to screw down the feed cap until the lower flange face of the ferrule presses upon the lead washer in the recess, and screw back the flanged screw at the top of the T-piece. Drawing shows all details of operation.




# Used Steel Rope Strengthens Timber Caps

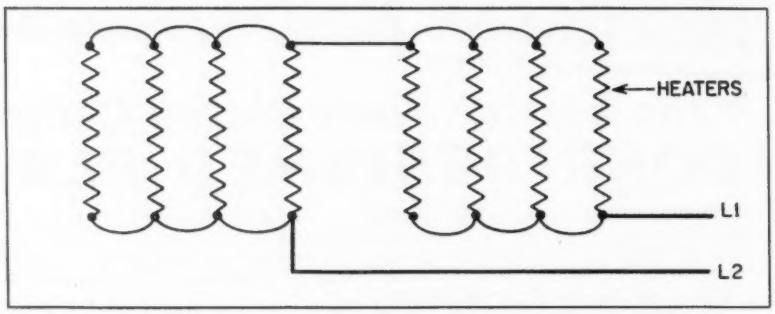
WHEN ADVANCING DRIFTS and crosscuts in heavy ground it will be found advantageous to strengthen the caps of the timber sets in the manner shown in the accompanying sketch. Use is made of a short length of steel rope which is placed as tight as possible around the length of the cap. The ends overlapping at the top are nailed down. If the cap is made from round timber, it is recommended that a guide groove be provided at the bottom of the cap to hold the rope in place. Another way is to hold the tightened rope by means of U-clamps. Installation of the reinforced cap follows standard procedure. Pressure exerted by the roof on the end lagging will hold the rope securely in place at all times. Any pressure at the center of the cap will instantaneously be taken up by the steel rope, thereby preventing excess bend on the part of the cap leading to eventual failure.

# Heater Hook-Ups

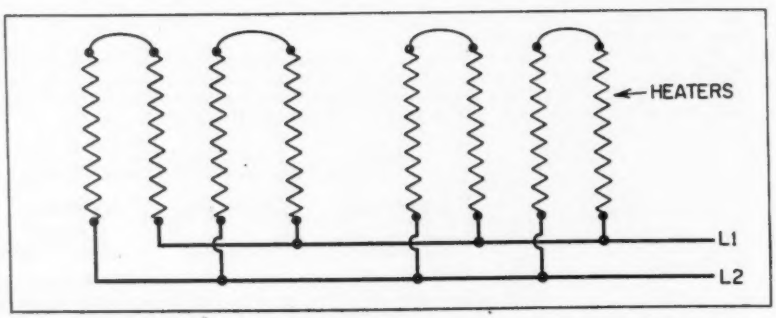
WHEN HOOKING UP groups or banks of heating elements for series-parallel operations, a group should never be interconnected in parallel—then in series with another group. Always connect pairs of heaters in series; then connect pairs in parallel. Should one group fail when a group is connected in parallel and in series with another group, a reversal of load will cause the high resistance group to take the overload. This may cause the entire group of heaters to burn out.

The purpose is to achieve load balance across supply lines. The first circuit at left accomplishes this function. But the failure of a single element will upset the balance to over-power the rest, thus causing total element failure or a ruptured fuse.

The second (correct) circuit also achieves balance of load across the power line. However with a straight parallel-series connection, the balanced condition is retained even though an element should fail.




**WRONG CONNECTION.** A single element failure would disrupt this circuit.




**RIGHT CONNECTION.** A single element failure will not disrupt this circuit.

# 40

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# PERSONAL NEWS

**Philip W. Simmons,** assistant chief of the ore procurement branch, AEC, is shown inspecting a high-grade ore exposure at the famous Happy Jack mine, White River District, Utah. The mine is owned by Cooper & Bronson, of Monticello.

**George M. Potter,** mining attache to the U.S. Embassy in Mexico, visited mining properties there with **Frank Noe,** former Mexican attache who has been transferred to New Delhi, India.

Named to newly-created positions in the Bureau of Mines were: **Thomas H. Miller,** deputy director for operations; **Paul Zinner,** assistant director in charge of programs; **Clifford W. Seibel,** assistant director in charge of helium operations; **James Westfield,** assistant director in charge of health and safety operations; **Charles W. Merrill,** chief, mineral division; **Louis C. McCabe,** chief solid fuels; **Roscoe A. Cattell,** petroleum and natural gas; **Harry F. Weaver,** coal mine inspection; **E. W. Pehrson,** foreign division; and **William E. Rice,** administrative division. New regional directors are: **Stephen M. Shelton,** Region I; **Harold C. Miller,** Region II; **John H. East, Jr.,** Region III; **Harold M. Smith,** Region IV; **Harold P. Greenwald,** Region V.

**John L. Miller,** La Crosse, Wis., has been named sales engineer for Aero Service Corp.

**James W. Cole,** formerly with American Cyanamid Co.'s atomic energy division, Winchester, Mass., is now mill superintendent and metallurgist at Surcease Mining Co., a tungsten property at Red Mountain, Calif.

**W. M. Kelley,** vice president in charge of operations of Republic Steel Corp. for the past five years, has been named president of Reserve Mining Co. Kelley will be available to Republic Steel in a consulting capacity.

**W. C. Noncarrow** has been named assistant manager of Port Radium operation of Eldorado Mining and Refining Ltd. Formerly he served as mine superintendent, where he is succeeded by **V. J. Pittson.**

**David C. Sharpstone,** consulting geologist to the Ventures group and chairman and managing director of Kilembe Mines Ltd. has been appointed a director of Uganda Development Corp. through an order in council of **Sir Andrew Cohen,** Governor of Uganda.

**Dr. A. F. Banfield** and **Roland F. Parks,** of Behre Dolbear & Co., have been in Labrador, doing field work in connection with a valuation of ore deposits.

**J. B. Beaty,** former president of Granby Consolidated Mining, Smelting & Power Co., Ltd., has been named chairman. Mr. Beaty was succeeded by **L. T. Postle,** former vice president and general manager, **J. A. C. Ross** became general manager.

**A. W. Witherspoon,** in active association with Hecla Mining Co., Wallace, Idaho, since 1931, has retired from the board of directors. He is succeeded by **R. N. Hunt,** director, vice president and chief geologist of US Smelting Refining and Mining Co.

**Elton A. Youngberg,** with the AEC since September 1952, has been named director of the mining division of the Grand Junction operations office. He has been acting director of the division since the resignation of **Frank McPherson** in June 1954. **John J. Curzon,** formerly of Howe Sound, is deputy director of mining. **John W. Burns,** metallurgical engineer, has joined the staff of the processing division of the office. Both announcements were made by **Sheldon P. Wimpfen,** manager.

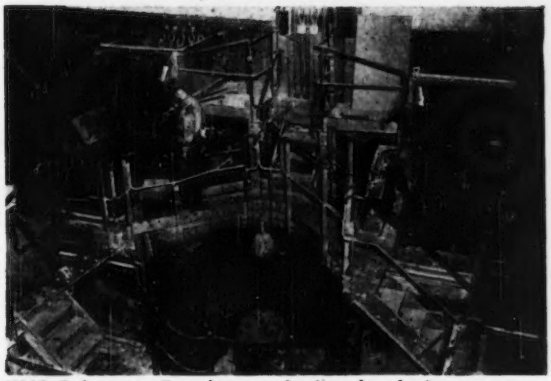
**H. C. McDaniel,** former manager of technical publicity for Westinghouse, will now supervise technical publicity operations and the *Westinghouse Engineer* magazine in his new capacity as manager of technical information.

**Roy B. Young** has been named general manager of Quebec Iron and Titanium Corp., succeeding **F. E. Walling.** The corporation has mining and smelting operations in the Province of Quebec.

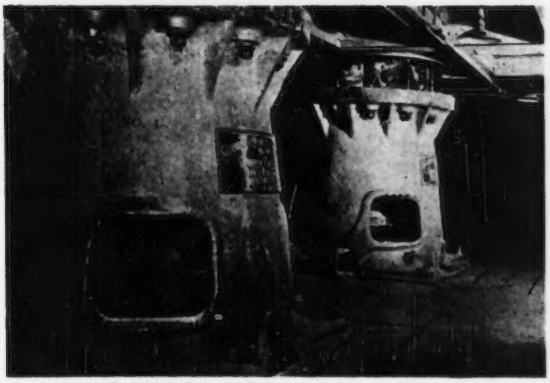
**Frank Coolbaugh,** vice president-western operations of Climax Molydenum Co., has also been elected president and a director of Climax Uranium Co. He replaces **John H. White, Jr.,** who resigned.

**James K. Richardson** is now assistant general manager in charge of labor, public and industrial relations at Kennecott Copper Corp.'s Chino mines division in New Mexico.

# For Any Crushing Purpose KENNEDY Gyratory Crushers *are first choice the world over!*



KVS Primary Crusher reducing lead zinc ore from mine run to 2-⅞".



Battery of KVS Secondary Crushers installed in lead zinc operation.

No matter what type of rock or ore you crush there is a KVS crusher made to handle the job. Primary and secondary crushers, built to meet *your* exact requirements.

Limestone, Basalt, Taconite . . . Zinc ore, Feldspar . . . *anything* from Phosphates to Slag, crushed to any desired fineness by pre-tested, *engineered* crushers that deliver peak tonnage, year after year, at minimum maintenance cost.

KVS Gearless Gyratory Crushers are world-famous for economical operation, rugged construction and adaptability to the crushing of a wide range of products. Our sales-engineering department is available for consultation anywhere on your crushing problems. Over a half-century of know-how is at your disposal.

**EXCLUSIVE FEATURES OF THE KVS GEARLESS GYRATORY CRUSHER**

- Synchronous motor built into pulley assembly or V Belt drive if desired.
- Smooth, frictionless operation — the crusher is gearless.
- Power used ONLY for crushing.
- All moving parts carried on self-aligning roller bearings.
- KVS forced-feed oiling system pumps four barrels or more of oil per hour through bearings without waste.
- Eccentric and ball spray babbitted. NONE has required rebabbitting in over five years.

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**John F. Hatch III,** supervisor of one of the mines of International Minerals and Chemical Corp., Bartow, Fla., is the first recipient of the newly-established mineral engineering fellowship at Harvard Graduate School of Business Administration.

**Norman R. Alston,** head metallurgist at AS&R's Garfield smelter, is now superintendent of smelters, Braden Copper Co., Caltetones, Chile.

**Wayne H. Burt,** who has been serving in the industrial engineering department of Kennecott's Utah Copper division, is now in the office of **Frank R. Milliken,** vice president in charge of mining, New York City.

**A. H. Barrios** is now director of employee relations with Cerro de Pasco at Lima, Peru. Mr. Barrios was formerly with Andes Copper at Potrerillos.

**L. H. Lange,** vice president of The Galigher Co., and consulting metallurgist for Mt. Isa mines in Australia and Tsumeb Corp. in South West Africa, has returned from a round-the-world trip, during which he visited those properties and Broken Hill, Radium Hill, King Island and the Kalgoorlie district in Australia, O'Okiep Copper and the copper and pyrite districts of Africa, and Buchans, Newfoundland, the latter for AS&R.

**C. O. Crump** was elected to the board of directors and made president of Sanford-Day Iron Works at a recent board meeting. Mr. Crump succeeds **P. S. McCallen,** retired. Other officers elected were **R. E. Jones** and **W. D. Moreman,** vice presidents.

**Edward A. Loria** is now staff metallurgist with Crucible Steel of America.

**Robert E. Hayes,** formerly with Sunshine Mining Co. at Kellogg, Idaho, and Polaris Mining Co., at Wallace, is now with Pend Oreille Mine & Metals Co.. Metaline Falls, Wash.

**E. H. Rose,** metallurgical and chemical engineer, has taken a temporary assignment with the National Research Council, Washington, D. C., as an advisor on less common metals.

**W. G. Fetzger,** chief geologist of Oglebay-Norton & Co., has moved his offices from Duluth to the company home office in Cleveland.

**Dr. Lloyd M. Pidgeon,** University of Toronto, has been named recipient of the first Ambrose Monell Medal for distinguished achievement in mineral technology by Columbia University School of Mines.

**W. P. Wolff,** chief mining engineer for Oliver Iron Mining in the Hibbing-Chisholm district, retired Nov. 1 after 35 years service with the company. He is succeeded by **Milton R. Sermon.**

**Carl Tolman,** who has been associated with Washington University as a member of the faculty since 1927, has been named vice chancellor and dean of faculties.

**Elton Clark** has been named chief engineer of mining operations of Phelps Dodge Corp.'s Burro Mountain mine, at Tyrone, N. M. He succeeds the late **Paul Yates.**

**B. E. Grant,** former director of labor relations for United States Smelting Refining and Mining Co., has established a mining management service office, directing particular attention to uranium mining.

**Carlos O. Rodriquez,** formerly of AS&R, **John M. Petkovsek,** DuPont, and **Howard L. Moore, Jr.,** Shamrock Oil & Gas, have all joined the staff at the Carlsbad plant of International Minerals and Chemical Corp.

**George C. Heikes** has been named consulting mining geologist for Camoose Mines, Ltd., of Canada. Camoose is the former Simplot uranium property in Boise, Idaho.

**E. C. Van Blarcom,** former consulting metallurgist for Singmaster & Breyer, of New York City, is now with the raw materials division of the AEC.

**F. L. Smith** has been appointed mine manager at Burnt Hill Tungsten mines, operating in York County, British Columbia.

**Duncan R. Derry,** former chief geologist for Ventures, Ltd., is now executive vice president of Rio Canadian Exploration Co., subsidiary of Rio Tinto Co., London, and Sogemines Ltd.

**Roy Kivisto,** Negaunee, Mich., has joined the USBM office at Duluth as safety instructor.

**Fred J. Hoff** is now with Climax Molybdenum Co. as research metallurgist, having completed a 3-yr contract as mine superintendent with Lepanto Consolidated Mining Co., Philippines.

**Francis B. Speaker** has been named manager of non-ferrous metal mining industry sales development by Hewitt-Robins, Inc., Stamford, Conn. Mr. Speaker will continue as consultant to GSA.

**P. C. Emrath** has recently returned to the U.S. on termination of a 3-yr assignment in Formosa on development of mineral industries with J. G. White Engineering Corp. and is resuming consultant mining and related practice at 1121 E. Cooper Drive, Lexington, Ky.

Recent changes at St. Joseph Lead Co. include: **Lawrason Riggs III,** from superintendent of Indian Creek operations to Bathurst, New Brunswick, Can., as resident manager of Brunswick Mining and Smelting Corp. Ltd.; **L. W. Casteel** to succeed Mr. Riggs at Indian Creek; **F. F. Redfield** to division superintendent at Mine La Motte; **Marvin E. Lane,** mining engineer, to the mining department of the southeast Missouri division.

**Stanley D. Michaelson** has been named chief engineer of the western mining divisions of Kennecott Copper Corp., according to an announcement by **J. P. Caulfield.** Mr. Michaelson will make his headquarters in Salt Lake City.

**William A. Harrigan,** Reno, Nev., is now superintendent of mines at Park City, Utah, for New Park Mining.

**J. Frank Sharp,** chief geologist for Consolidated Coppermines Corp., Kimberly, Nev., has been named superintendent of operations there.

**Heath Steele,** vice president and director of the American Metal Co., Ltd., is re-

*(Continued on page 177)*

## OBITUARIES

**Mack C. Lake,** 64, former president of U.S. Steel's Orinoco Mining Co., died Nov. 9 in San Francisco, Calif., following a lengthy illness. Exploration under his direction led to the discovery of Cerro Bolivar's iron ore deposits.

**James J. Carrigan,** 67, retired manager of mines of the Anaconda Copper Mining Co., died suddenly on Oct. 17 while on a visit to relatives in Green Bay, Wis.

**Ray Lahiff,** Butte, Mont., foreman of the Lexington mine of Anaconda Copper Mining Co., died suddenly Oct. 21.

**George H. Rupp,** 63, manager of the mining department of Colorado Fuel & Iron Co. died Oct. 11. An exponent of modern mining techniques, he saw CF&I win many safety awards during his tenure.

**Alex M. McDonald,** 53, in charge of geological exploratory operations for Anaconda Copper Mining Co., died Oct. 27 following a brief illness.

**William J. Wilcox,** Butte, Mont., retired chief clerk of Anaconda Copper Mining Co., died in a Missoula, Mont., hospital on Sept. 10.

**Gilbert H. Turner,** 48, director of industrial relations for the Timken Roller Bearing Co. passed away Oct. 9. He had been a member of the Timken organization for 26 years.

**H. R. Tunnell,** 74, prominent mining man and retired foreman of the Steward mine of Anaconda Copper, died Oct. 25 at his home in Chula Vista, Calif.

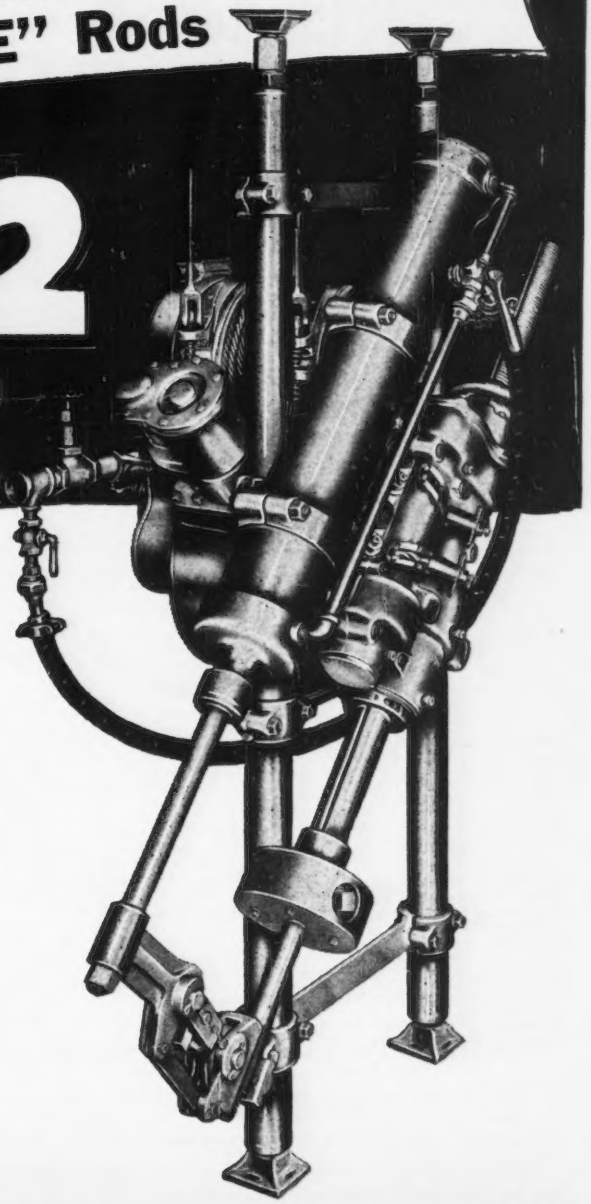
**Swain J. Swainson,** 53, for many years director of American Cyanamid's mineral dressing laboratories at Stamford, Conn. died Oct. 22 at Southold, Long Island, after a prolonged illness.

# GREATER DEPTH UNDERGROUND

## 1800 Ft. with "E" Rods

# BBU-2

## UNDERGROUND DIAMOND DRILL



The BBU-2 is unexcelled for deephole underground drilling. It is sturdily constructed yet light in weight for its capacity. Maintenance costs are low. "A" size, gear feed (4) swivel-head. Available with cable hoist and/or single or dual 5⅛ inch (piston diameter) rod pullers. Capacity 1800 ft. with "E" rods, 1400 ft. with "A" rods, 1000 ft. with "B" rods. Net weight range 980 to 1090 pounds.

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 (Continued from page 69)

## Copper Statistics— January-October 1954

Following is a summary of the Jan.-Oct. copper statistics of Copper Institute, figures in short tons:

UNITED STATES

| | Crude Production Primary | Crude Production Secondary | Refined Production | Deliveries to Fabricators | Stocks Refined at End |
|---|---|---|---|---|---|
| January | 76,912 | 7,304 | 111,553 | 77,091 | 108,121 |
| February | 68,034 | 6,394 | 103,496 | 89,017 | 118,417 |
| March | 73,429 | 7,671 | 117,546 | 95,795 | 125,759 |
| April | 70,977 | 6,486 | 112,617 | 104,579 | 124,523 |
| May | 71,571 | 6,660 | 108,403 | 111,005 | 82,111 |
| June | 74,113 | 11,216 | 112,121 | 106,252 | 69,181 |
| July | 66,070 | 9,597 | 107,095 | 97,436 | 68,921 |
| August | 52,825 | 8,784 | 103,901 | 92,475 | 58,387 |
| September (a) | 61,827 | 7,168 | 87,874 | 89,198 | 47,666 |
| October | 68,521 | 9,862 | 92,258 | 105,293 | 32,515 |

OUTSIDE UNITED STATES

| | Crude Production Primary | Crude Production Secondary | Refined Production | Deliveries to Fabricators | Stocks Refined at End |
|---|---|---|---|---|---|
| January | 114,652 | 531 | 85,100 | 91,941 | 280,510 |
| February | 109,041 | 702 | 70,864 | 74,457 | 275,375 |
| March | 123,441 | 583 | 93,824 | 93,235 | 279,804 |
| April | 124,846 | 176 | 87,747 | 99,193 | 273,070 |
| May | 118,099 | 262 | 95,564 | 115,197 | 255,234 |
| June | 124,503 | 266 | 88,615 | 130,323 | 180,651 |
| July | 130,518 | 358 | 105,827 | 105,281 | 170,558 |
| August | 122,656 | 801 | 100,437 | 103,405 | 172,326 |
| September (a) | 125,158 | 506 | 107,489 | 110,234 | 172,048 |
| October | 139,656 | 350 | 104,396 | 107,193 | 177,917 |

Note: The statistics do not balance largely because of deliveries to the U. S. stockpile. Production of Cuba and the Philippines included under U. S. (a) Corrected.

## U. S. Zinc Stocks Down

A summary of the latest slab zinc statistics of the American Zinc Institute, in short tons, follow:

| | (a) Sept. | Oct. |
|---|---|---|
| Stock at beginning | 193,253 | 175,505 |
| Production | 60,137 | 67,047 |
| Production, daily rate | 2,004 | 2,163 |
| Shipments: | | |
| Domestic | 64,548 | 78,868 |
| Export-Drawback | 1,072 | 1,468 |
| Government acc't | 12,265 | 10,080 |
| Totals | 77,885 | 90,415 |
| Stock at end | 175,505 | 152,137 |
| Unfilled orders | 48,818 | 51,559 |

(a) Revised figures

Slab zinc production in September and October, by grades, in tons:

| | (b) Sept. | Oct. |
|---|---|---|
| Special high grade | 17,651 | 18,858 |
| Regular high grade | 1,409 | 7,095 |
| Intermediate | 1,734 | 2,063 |
| Prime Western, etc. | 39,323 | 39,016 |
| Totals | 60,117 | 67,032 |

(b) Revised, with deductions for metallurgical losses.

## Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted.

### MISCELLANEOUS METALS

November 30, 1954

| | |
|---|---|
| Aluminum ingot, 99 plus percent, lb. | 22.2¢ |
| Antimony, spot, lb., less than carload, in cases | 31.97¢ |
| In bulk, carload lots, f.o.b. Laredo | 28.50¢ |
| Bismuth, ton lots, lbs. | $2.25 |
| Cadmium, commercial sticks, delivered, lb. | $1.70 |
| Calcium, lb., ton lots, 98 percent, cast | $2.05 |
| Chromium, 97 percent grade, lb., contract | $1.18 |
| Cobalt, 9- to 99 percent, per lb. | $2.60 |
| Germanium, lb. | $295.00 |
| Indium, troy oz. | $2.25 |
| Lithium, lb., 98 percent | $11.00 @ $14.00 |
| Nickel, cathodes, lb., f.o.b. Port Colborne (a) | 64½¢ |
| Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas | 27¢ |
| Palladium, troy oz | $17 @ $21 |
| Platinum (wholesale lots) troy oz. | $77.00 @ $84.00 |
| Quicksilver, flask of 76 lbs., 25 flasks or more | $318 @ $322 |
| Selenium, 99 plus percent, lb. | (b)$5.00 @ $6.00 |
| Silicon, minimum 97 percent, carloads, lb. | 18¢ |
| Tellurium, lb. | $1.75 |
| Thallium, 100 lb. or more, lb. | $12.50 |
| Titanium, 99.3 plus, grade A, lb. | (c)$4.50 |

(a) Includes U. S. duty. (b) Depending on quantity. (c) Effective Dec. 1.

### METALLIC ORES

| | |
|---|---|
| Beryllium Ore, imported, 10% BeO, per short ton unit | $39.00 |
| Chrome Ore per long ton, f.o.b. cars Atl. ports, dry: | |
| 44% $Cr_2O_3$ no ratio | $21.00 @ $22.00 |
| 48% $Cr_2O_3$ 3 to 1 ratio | $43.00 @ $46.00 |
| Iron Ore, Lake Superior, Lower Lake ports, long ton: | |
| Old Range bessemer | $10.30 |
| Mesabi bessemer | $10.05 |
| Mesabi, non-bessemer | $9.90 |
| Lead (Galena), 80 percent, Joplin, Mo., ton | $187.85 |
| Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties 74 @ 77¢ c.i.f. U. S. ports, duty extra. Long-term contract nominal at 74 @ 77¢ c.i.f. duty extra. | |
| Molybdenum Ore, 90%, per lb. of $MoS_2$ f.o.b. mines | 60¢ |
| Columbium-Tantalum, per lb., combined oxides | $3.40 |
| Tungsten Ore, per unit of $WO_3$: | |
| Foreign 60 percent, c.i.f. U. S. ports, duty extra | $25.50 @ $26.00 |
| Domestic, scheelite, 60 percent f.o.b. mill | $63.00 |
| Vanadium Ore, per lb. of contained $V_2O_5$ f.o.b. mines | 31¢ |
| Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton | $68.00 |

### METALLIC COMPOUNDS

| | |
|---|---|
| Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered | 5½¢ |
| Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb. | $1.96 @ $1.97½ |
| Copper Sulphate, 100 lb. | $10.35 |
| Germanium Oxide, lb. | $142.00 |

### ALLOYS

| | |
|---|---|
| Ferrochrome, 65 to 69 percent, per lb. of Cr contained | 24¾¢ |
| Ferromanganese, 74–76%, net ton, seaboard | $190 |
| Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained | $1.32 |
| Ferrosilicon, 50 percent per lb. of contained Si | 12¢ |
| Ferrotungsten, 75 to 80 percent, lb. of W contained | $3.80 |
| Ferrovanadium, per lb. of V delivered | $3.00 @ $3.25 |
| Silicomanganese, Max. 1½ percent carbon, lb. per contracts | 11.4¢ |
| Spiegeleisen, per long ton, 19 @ 21% grade | $86.00 |

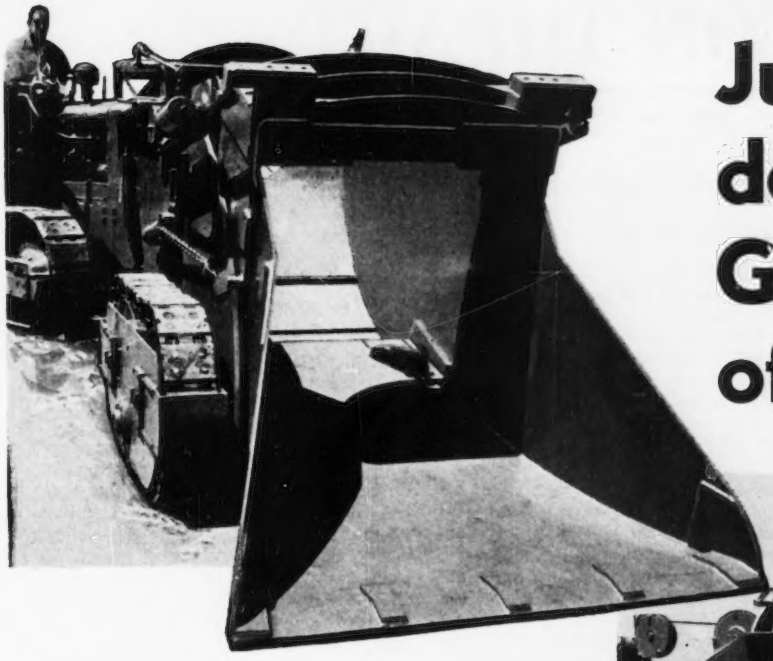
### NON-METALLIC MINERALS

| | |
|---|---|
| Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton: | |
| Crude No. 1 | $960 @ $1,500 |
| Crude No. 2 | $595 @ $900 |
| Spinning fibers | $321 @ $514 |
| Shingle fibers | $150 @ $200 |
| Paper stock | $109 @ $137 |
| Waste | $77 |
| Shorts | $35 @ $70 |
| Asbestos, f.o.b. Vancouver, B. C. (U. S. funds): | |
| Spinning fiber, 3-K | $460 |
| Shingle fiber, 4-K | $185 |
| Asbestos, Vermont, f.o.b. Hyde Park: | |
| Spinning fibers | $279.50 @ $302.00 |
| Shingle stock | $135.00 @ $162.00 |
| Paper stock | $81.50 @ $115.00 |
| Waste, stucco or plaster | $71.40 |
| Refuse or Shorts | $34.00 @ $63.00 |
| Barytes f.o.b. cars: | |
| Georgia, crude, per ton | $15.00 |
| Missouri, 94 percent $BaSO_4$, per short ton | $13.25 |
| Bauxite, long ton, f.o.b. point of shipment: | |
| Domestic crude, 50 to 52 percent (not dried) | (a) $5.00 @ $5.50 |
| Domestic, chemical, 55 to 58 percent | (a) $8.50 @ $9.05 |
| Domestic, abrasive, 80 to 84 percent | (a)$18.00 @ $18.50 |
| Feldspar, bulk ton. | |
| Potash or soda feldspar, 200 mesh, ceramic grade | $18.50 @ $22.25 |
| Glass feldspar, white, 20 mesh | $11.75 @ $12.50 |
| Fluorspar, f.o.b. mines, bulk, 70% effective, ton | $32.00 @ $33.00 |
| 60% effective $CaF_2$ | $28.00 @ $29.00 |
| Acid 97% concentrate, bulk, ton | $47.50 |
| Fuller's earth, f.o.b. Georgia or Florida, ton | $7.00 @ $14.00 |
| Magnesite, per ton dead-burned, bulk, f.o.b. Washington | $38.00 |
| Mica—Domestic, f.o.b. mines, Punch 12 to 22¢. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 70¢. to 85¢.; 2 x 2 inch, $1.10 to $160; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet. ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap $25 and up. | |
| Ocher, Georgia, ton, in sacks | $26.50 @ $30.00 |
| Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports | Not quoted |
| Sulphur, Texas, mines, long ton | $25.50 @ $27.50 |
| Talc, f.o.b. works, ton | |
| New York, purified | $18.50 @ $20.00 |
| Vermont, extra white | $13.50 |
| Tripoli, Missouri, ton: | |
| 40 mesh, cream colored | $30.00 |

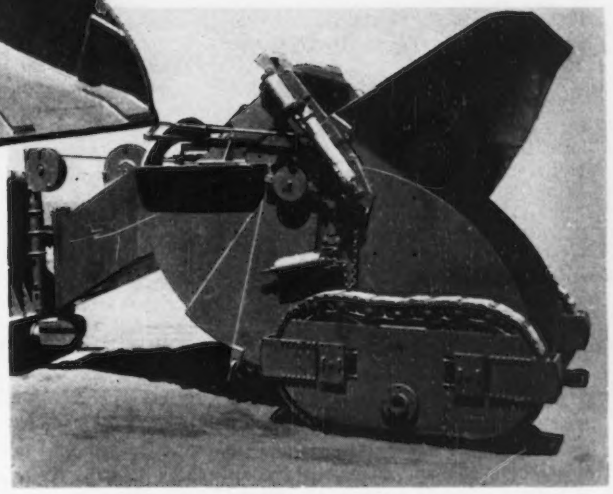
(a) Normal. (b) Effective Oct. 1.

### IRON AND STEEL

| | |
|---|---|
| Pig Iron, gross ton, basic, Valley Furnaces | $56.00 |
| Steel f.o.b. Pittsburgh, billets, net ton | $64.00 |
| Structural shapes, 100 lb. | $4.25 |



# Just what does the GISMO offer you...



The two photos above show extreme position the S-D GISMO shovel mechanism takes while loading. Upper photo shows shovel ready to begin loading stroke and lower photo shows position of shovel at end of stroke, loading material back into body. Photo at bottom of page shows Gismo with tractor, operated by only one man.

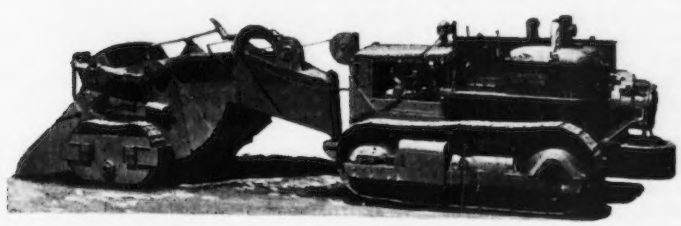
THE GISMO offers you a new method of mining. One that over a period of 2 1/2 years of intensive development in actual work has proved beyond question advantages that merit its thorough investigation by any firm excavating rock or its equivalent.

The Gismo offers you a *general purpose utility* self-loading transport that is simple, versatile and built to take the brutal punishment of rock excavation—and at important savings! It is well suited to almost all mining conditions. No special development facilities or conditions are usually required. It operates in sloping ore bodies with irregular outlines, as well as large or relatively small openings. The Gismo is easily maneuverable at maximum or minimum speed of the equipment.

With perhaps a few exceptions, the Gismo can be taken into any mine. Its cross sectional dimensions are small compared with other equipment. It can easily be dis-assembled for lowering through small shafts.

Its versatility meets every requirement. It loads (mucks) in development or production . . . transports . . . drills (supports 2 to 5 jib mounted drills) . . . back fills . . . moves boulder rocks . . . makes its own roadways and cleans up completely.

The Gismo is an efficient machine that can load and transport up to 100 tons per hour with a 300 ft. haul . . . drill at rate of 400 ft. per man shift . . . is an extremely simple piece of equipment built for rough work and requiring little maintenance. Its initial cost can be reasonably compared with one year's maintenance cost alone of much of the conventional equipment in present use. It makes possible a mining method requiring few machines, few men, less planning and integration. It allows total mechanization of your mine—the solution to present economic conditions of high man-hour and materials cost, and low metal prices. Contact us for complete information. Sanford-Day Iron Works, Inc., P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tennessee.



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PUMPS - OIL SPRAY SYSTEMS

# WASHINGTON IMPACT

*Morton A. Reichek, McGraw-Hill Washington News Bureau*

## New Congress May Mean Mine Subsidies; Tariff Relief Measures Not in Sight

MINE SUBSIDY LEGISLATION will be taken a lot more seriously by the Democratic-controlled 84th Congress than it was by the previous Congress. Sponsors of last session's bills will become influential committee chairmen in the new Congress.

During the 83rd Congress, "Mine Incentive Payments" bills were introduced by Sen. James E. Murray (D., Mont.), Rep. Gracie Pfost (D., Idaho), and Rep. Lee Metcalf (D., Mont.), The bills were quickly shelved.

This time, however, Murray will head the Senate Interior Committee, succeeding the late Sen. Hugh Butler (R., Neb.) and Sen. Guy Gordon (R., Ore.), and Mrs. Pfost is slated to head the House Mining Subcommittee.

It's likely that both Murray and Mrs. Pfost will reintroduce their mine subsidy bills, then put their committees to work on them. But whether the bills could eventually be enacted is questionable.

On other important committees, Rep. Clair Engle (D., Calif.) will succeed Rep. A. L. Miller (R., Neb.) as chairman of the House Interior Committee. The future of the Senate Interior's Mining Subcommittee, which has been so active under Sen. George Malone (R., Nev.), is uncertain. If it is reorganized, it's likely that either Sen.-elect Joseph C. O'Mahoney (D., Wyo.) or Sen.-elect Alan Bible (D., Nev.) would become chairman.

Prospects for a sliding-scale import tax bill on lead and zinc—or any other tariff relief measure—are nil in the new Congress. Such legislation failed to pass in the previous Congress, and the new Congress is even more favorably inclined toward freer-trade policy.

Two other important mining bills are expected to come up in the new Congress. One would open up public land, now withdrawn for power projects, to mineral development. The other would clarify surface rights of mining claimants to prevent abuses under the mining laws. Both will be discussed in detail later.

## DPA Inventory

YOU'RE BOUND to get confused if you try to figure out how Government-owned stocks of metals and minerals shape up. But not necessarily because of national security considerations. The main reason is the complexity of federal bookkeeping.

Washington's holdings are scattered in four different inventories:

The $5 billion-plus original "minimum" stockpile;

The new "long-term" stockpile, made up mostly of domestic metal, which may amount to about $300-million next year;

The "supplemental" stockpile to be built up of metals and minerals acquired through barter of farm surpluses;

And the so-called "Defense Production Act inventory" of goods piled up under GSA-DMPA floor-price purchase commitments.

According to recent figures obtained by *E&MJ*, the DPA inventory consists of $446.7-million worth of metals and minerals and over $58.1-million worth of strategic agricultural products, much of which will be dumped into the regular stockpile by next July. Following is a breakdown on metals and minerals:

| | |
|---|---|
| Aluminum pig | 175,000 tons |
| Asbestos | 936 tons |
| Beryllium ore | 527 tons |
| Chrome | 157,223 tons |
| Cobalt | 20,000 lb. |
| Columbium-tantalum | 1.4-million lb. |
| Copper | 12,600 tons |
| Cryolite | 13,447 tons |
| Fluorspar | 56,975 tons |
| Lead | 108 tons |
| Magnesium | 3,750 tons |
| Manganese | 18.4-million long-ton units |
| Mica | 1.3-million lb. |
| Molybdenum | 4-million lb |
| Nickel | 18.7-million lb |
| Tin | 92.1-million lb |
| Titanium | 2.8-million lb |
| Tungsten | 2.5-million short-ton units |
| Zinc | 13,031 tons |

## Lead-Zinc Imports Down

FEARS THAT WASHINGTON'S domestic lead-zinc stockpile program might really become a boon for foreign producers haven't materialized. So far, at least. State Department officials, who are keeping a close watch on imports, believe foreign shipments this year will be well below last year's volume.

State figures that this year's lead imports will total 451,000 tons; compared to 549,000 tons in 1953; zinc 603,000 tons this year, compared to 746,000 tons in 1953. Officials consider this year's import volume as "normal" for lead and "still above normal" for zinc.

Under the new lead-zinc stockpile plan, State is supposed to "seek recognition" by foreign producers that stepped-up stockpile buying is restricted to U.S. output, and that foreign producers "will not themselves seek to take any unfair advantage of it."

What State would do if imports got out of hand is unclear. About the best the department could do is extend a diplomatic warning to foreign producers that an abnormal spurt in shipments here might force the Administration to switch signals on tariff policy.

## Mobilization Reservists

AS&R VICE PRESIDENT Simon D. Strauss and James Boyd, Kennecott Copper's Exploration Manager, have been named to ODM's "Executive Reserve," a group of about 50 industry executives who would be mustered for government duty in case of war. They're getting special jobs, slots ODM would need to fill in wartime. These are high-level policy posts dealing with expansion programs, production controls, allocations, price-wage-manpower controls, and the like.

Strauss and Boyd are the first mining men selected. Others will be included among the 150 additional executive reservists ODM may name next year. The businessmen-reservists will come to Washington only a couple of days a year to keep their hand in mobilization planning. ODM considers this a pilot operation in a plan to set up a civilian counterpart to the organized military reserve.

If it comes out well, plans are for other government agencies which would have big wartime roles to follow suit. Interior Department, for example, would name some mining men as reservists to operate emergency controls on the mining industry. (ODM's function, by comparison, is to set policy.)

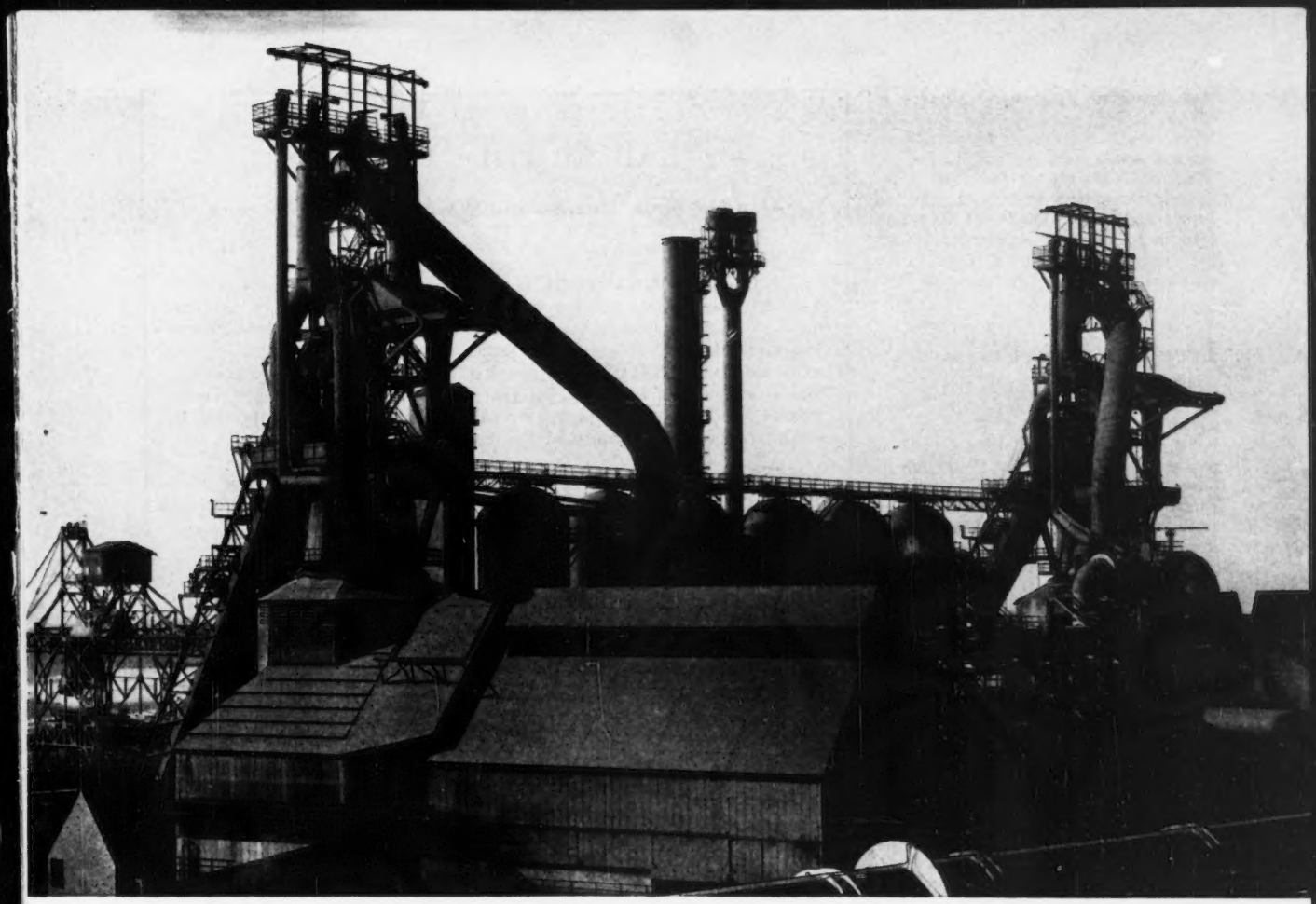
Commerce Department's Business and Defense Services Administration, which would operate wartime controls on manufacturing industries, already has an executive reserve of sorts, based on the stream of businessmen (many of them metal fabricators) who served as BSDA officials.

There's some skepticism on the ODM plan. It's felt that a well-known bureaucratic tradition might shove all the ambitious reserve planning down the drain: the wartime practice of setting up brand-new agencies to take up emergency functions.

## Government Mining Loans

SMALL BUSINESS ADMINISTRATION has finally untied its lending purse strings for small mining firms. The agency has made direct loans of $56,000 to Klamath River Chrome Co., Klamath River, Calif., and $48,000 to MacPhaill Gypsum Co., Visalia, Calif. In addition, SBA has approved a $150,000 loan to M. C. Boyle Phosphate Co., Centerville, Tenn., in which a local bank will participate.

Ten other loans have been made to small firms operating limestone and marble quarries and sand and gravel pits.



# THE BLAST FURNACES THAT WERE BOUGHT "SIGHT UNSEEN"

THE owners bought this plant before the plans were on paper. You'll be doing that, too, when you sign a contract for your new plant—and you'll have to be *sure* of the qualifications of the firm you hire.

McKee has a long, successful record of sound, practical engineering and construction of projects like yours all over the world. It's the result of accurate analysis and thorough thinking-through of every detail of design, construction and equipment by a well-qualified staff of experienced technical specialists and field personnel.

You can't buy your plant *after* it's built, but you *can* make sure it will be correctly designed and efficiently constructed when you call in McKee.

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*Canada:* Arthur G. McKee & Company of Canada, Ltd., 372 Bay St., Toronto

Actually, mining has barely figured in SBA's lending program. This year, 953 loans worth $51.9-million have been made to small firms in all industries.

Klamath River Chrome's loan is for acquisition of land to build a mill and install equipment. MacPhaill Gypsum's loan is to refinance equipment bought previously. Boyle Phosphate's loan is for purchase of a washer site and equipment.

## Freeport Nickel Contract

AFTER TWO YEARS OF NEGOTIATION, GSA and Freeport Sulphur have signed a nickel contract. Freeport will build a semi-commercial pilot plant (capacity 50 tons daily) in Louisiana to prove the commercial feasibility of sulphuric acid leaching for recovery of nickel and cobalt from Cuban lateritic iron ores. GSA will pay construction and one-year operating costs of up to $6¼-million.

The contract also provides for "possible purchase" by GSA of 150 million lb of nickel and 15-million lb of cobalt from Freeport at prevailing market prices by June 30, 1963. That's roughly four years output from a commercial plant Freeport plans to build with private capital at Moa Bay, Cuba, if the new pilot plant is successful. But GSA's purchase commitment is strictly optional.

Earlier this year Freeport was granted a fast tax writeoff for construction of a leaching plant in Cuba and a refinery near New Orleans. Total cost of the project was estimated at over $50-million.

At that time Freeport hoped to jump directly into commercial production after testing the Chemico-developed sulphuric acid leaching process at a small pilot plant (5 tons daily) at Hoskins Mound, Tex. The plan depended on a long-term GSA purchase commitment.

The plan was roadblocked, however, when GSA refused to sign a purchase contract unless Freeport went into larger pilot operations—to "get all the bugs out of the Chemico process, if any."

## Lower "Buy U. S." Margin

SOME REPORTS INDICATE that President Eisenhower plans to reduce the margin of preference alloted United States firms relative to non-U.S. manufacturers and producers relative to purchases by the Federal Government.

Under the Buy American Act, passed in 1933, the Government must buy from domestic firms rather than foreign firms unless the latter price is 25% under the price of the U.S. producer.

According to reports, a proposed Executive Order would reduce the preference difference to 12%.

### CORRECTION

Last month's headline contained an error. It should have read "Mining Mobilization Authority Moves from GSA to Interior."—Ed.

# LABOR THIS MONTH

**Alan E. Adams, McGraw-Hill Washington News Bureau**

**MINE UNION FIGHTS IT OUT:** Leadership of the Mine-Mill & Smelter Workers union shows no signs of backing down in the face of Government evidence of Communist connections of its International Secretary-Treasurer Maurice Travis. When Travis was slated for jail following his indictment on charges of falsely denying he was a one-time party member, the Union promptly put up $10,000 bail. And to back up the Travis defense fund, Mine-Mill locals are raising their per capita payments to the International by 25c a month.

**THERE ARE TWO SIGNIFICANT POINTS IN THIS STAND:**

- Travis is the real power of the union. He's the sparkplug behind all Mine-Mill moves and there's no one in sight to take his place. That's why the International is going all-out in his defense.
- In sticking by Travis despite an expected attack by the Federal Government, Mine-Mill faces possible dissolution. The Justice Department may move soon against MMSW under the new anti-Communist laws that contain the power to break up a Communist-dominated union. To avoid this, the Mine Union would have to expel alleged Communist leaders, but apparently it has no such idea in mind.

**THE "JURY" IS READY:** The Subversive Activities Control Board, which will hear the cases against Red-controlled unions, is awaiting Justice Department charges. It's a little-known agency of five members, operating under a $238,000 budget. So far, its work has been confined to taking on the Communist Party membership, without relation to union activities. This group was the first to convict the top Red leaders. Here's the line-up of the board which may become the executioner of Communist-led labor organizations:

- Sitting as head of the SACB is former Ohio GOP Governor Thomas J. Herbert. A World War hero, he took steps in 1948, as his state's chief executive, to break a strike of another alleged Communist-run Union—the Electrical Workers Union (Ind.) by using the National Guard to open a strike-bound plant. Though Herbert permitted limited picketing of the plant, he's sure to be accused of anti-union activities by unions the Attorney General takes to task.
- Harry P. Cain, former Republican Senator from Washington, also seems certain to run up against an attack of labor bias. While in the Senate, Cain voted almost solidly against legislation benefiting labor. But his record on the Board has won acclaim from liberals for his rulings.
- The other three members are Dr. Kathryn McHale, a college professor in psychology and education; David J. Goddaire, an attorney and former assistant Attorney General of Massachusetts, and Watson B. Miller, one-time Federal Security Administrator who served as director of the American Legion's rehabilitation program for 18 years.

**MOST UNIONS BAR COMMUNISTS:** The record of anti-Red activities on the part of most unions is revealed in a new government survey by the Bureau of Labor Statistics. A review of 100 union constitutions shows that 59 have clauses that effectively bar Reds from office.

The survey discloses a striking figure—these 59 unions have 10-million members, or almost two-thirds of all organized workers.

**MINE-MILL GAINS UNDER NEW LABOR RULING:** The National Labor Relations Board has decided that an employer may bargain with an incumbent union, even though a rival union has enough votes to require a representation election. This helps MMSW, frequently under attack by the CIO Steelworkers. Even though the CIO union can show required support to force an election at an MMSW-organized mine, an employer can sign a new contract with Mine-Mill without awaiting the election outcome.

## Anaconda First to Roast Low Grade Sulfur Ore to produce $SO_2$ for Acid Manufacture

The world's first commercial installation for producing $SO_2$ gas from low grade sulfur ore, is now on stream at Anaconda Copper Company's plant at Weed Heights, Nevada.

The FluoSolids System that makes this possible includes four 18 ft. dia. Reactors plus other Dorr and auxiliary equipment. $SO_2$ gas is sent to a 450 TPD contact acid plant which supplies all acid requirements for leaching 11,000 tons of copper ore per day.

Feed to the system is 650 to 750 tons per day and gas production 26,000 to 30,000 C.F.M. Gas strength averages 8 to 12% representing a sulfur recovery of 98%. Unusual? Yes, because this is the first time that low grade sulfur ore could be recovered as $SO_2$ . . . economically. Here's how the system works . . . ore averaging 28% total sulfur is crushed to 10 mesh and fed dry to the Reactors which operate in parallel. Once ignition temperature is reached no extraneous fuel is needed. Ore is simply fed in at the design rate, latent heat in the bed immediately brings it to ignition temperature, and the fluidizing air oxidizes the sulfur to $SO_2$. Shutting down is a matter of minutes. And because the fluid bed stores sufficient heat, roasting can be started again after as much as 72 hours without adding additional fuel.

If you would like more information of FluoSolids . . . the most significant advance in roasting technique in the last 30 years . . . write The Dorr Company, Stamford, Conn., or *in Canada*, The Dorr Company, 26 St. Clair Avenue, East, Toronto 5.

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# THIS MONTH IN MINING

## American Metal Co.'s New Brunswick Discovery Brings Province to Canada's Mineral Forefront

### Amco Isn't Sure of Extent of Deposit— Knows Only That It's a Major Discovery

AMERICAN METAL CO. this month began concentrated probing with diamond drills of its new base metal discovery in New Brunswick.

Amco, which has world-wide holdings, wants to find out more about its latest acquisition. Toward that end, it has put 10 diamond drills to work. Preliminary estimates, based on drilling completed up to mid-October, established that the new find is of major proportions. But as to how much lead, zinc and copper the deposit actually contains, and whether the property should be mined by shaft or open pit, Amco isn't sure and expects to spend the next few months finding out. Actual production is not expected before 1956 at the earliest.

These preliminary estimates, which should be considered ultra conservative, indicated about 3-million tons of lead-zinc ore averaging 0.01 oz gold, 4.0 oz silver, 0.50% copper, 4.50% lead and 10.50% zinc. In addition, these first drilling results showed 1-million tons of copper ore averaging 1.90% copper, which also included values of 0.007 oz gold, 0.70 oz silver, 0.10% lead and 0.50% zinc. When figuring reserves, Amco is not classifying any material as ore which runs less than 10% in combined lead-zinc values.

An independent observer, *The Northern Miner*, commented that "Right now, the discovery stacks up as the highest grade, big tonnage base metal mine in Canada."

The deposit, 6 mi long by 4 mi wide, is in an area designated as Little River, about 30 mi northwest of Newcastle, a port on the Miramichi River. It also is some 30 mi southwest of Bathurst, center of a recent base metal rush (see *E&MJ*, May 1953, p 101).

#### Irregular Replacement Deposits

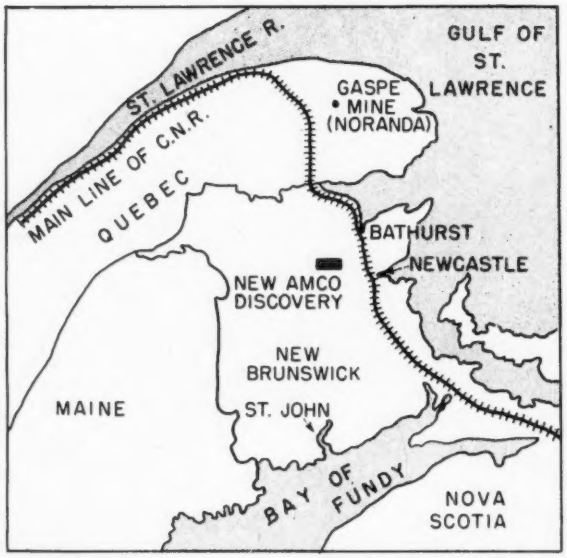
As to geology, an Amco official explained that "The main bodies are irregular replacement deposits in greenstone, although some ore has been found in quartz porphyry or agglomeritic material resembling quartz or feldspar porphyry."

The same official added that "It will require a great deal more drilling on the Little River property as well as surface stripping and the sinking of prospect shafts before a complete picture of the ore occurrence can be obtained.

"Plans dealing with milling will have to await the securing of sufficient underground samples for thorough mill testing, and it is still too early to make precise estimates," he said.

As with other recent discoveries in New Brunswick, the mineral wealth was well hidden. This latest find resulted from aerial surveys which indicated a promise of ore beneath the dense underbrush.

These aerial surveys were conducted on behalf of Amco by International Nickel Co. of Canada Ltd. For this work, Inco has obtained a 25% interest in the new property. Amco retains the remaining 75% interest.




**NEW FIND** is near 1953's famous Bathurst base metal rush.

Whereas the electromagnetic equipment used in the aerial survey was developed by Inco, a good measure of the credit must go to Dr. Stanley Davidson. Dr. Davidson worked on development of the Inco instrument and subsequently formed his own firm, McPhar Geophysics Ltd., which Amco employed for the subsequent ground survey. Also assisting in the exploration were helicopters from the Spartan Air Service of Ottawa.

#### Jenney Directs Program

The entire program is under supervision of Dr. C. P. Jenney, assistant manager of Amco's geological and exploration department. Roy Jure, manager of Amco's Toronto exploration office, has been helping from the start. Dr. E. L. Evans is chief geologist at Newcastle. Assisting Dr. Evans is Richard Hutchison. Douglas Chapman is supervising operations at Little River. Paul LaPrairie is office manager at Newcastle. All are Canadians.

Contract for 50,000 ft of diamond drilling went to T. Connors Diamond Drilling Co. of Vancouver. In addition to drill teams, many other artisans are busy at Little River today. An assay office, designed to handle 20 samples a day, has just been completed. The Dalton Engineering & Construction of Toronto is building camps. Bulldozers will be brought in soon to clear away brush and the 10-to-30 ft of overburden which blankets Amco's aggregate of 354 claims. Monthly Amco expenditures are more than $100,000.

N. B. Buchanan, New Brunswick Lands & Mines Minister, took obvious pride in announcing that "The discovery is of tremendous importance to New Brunswick's expanding mining industry and to the Province's future economy."

# Discovery of 468-Million Ton Iron Deposit In Labrador Announced By Canadian Javelin

CANADIAN JAVELIN Ltd., Montreal, announced Nov. 22 that it had proved up 468-million tons of commercial iron ore at holdings at Wabush Lake, Labrador, some 225 mi north of Seven Islands, Quebec.

The announcement was made in New York's posh Ambassador Hotel at a press luncheon attended by Premier Joseph R. Smallwood of Newfoundland and other dignitaries.

John C. Doyle, Canadian chairman, told reporters that the findings resulted from a year's drilling. Doyle added that in an area of 2,300 sq mi, 1,163,000,000 tons were indicated by drilling, of which 468-million tons was measured by close drilling. The ore was said to be "uniformly of premium grade, with no phosphorus, or other deleterious elements."

The deposit lies within a 3,360-acre tract on the Labrador-Quebec border, some 30 mi from the Quebec, North Shore & Labrador Railroad, which was built by the Iron Ore Company of Canada to link its deposits with Seven Islands (see *E&MJ*, August 1954, p 124). Iron Ore Company has announced reserves of 417-million tons.

Premier Smallwood pointed out that IOC's railroad was built as a common carrier, implying that Canadian Javelin could make use of the line in shipping its ore.

Paul E. Pesonen, Montreal mining engineer and chief engineer for Canadian Javelin commented that iron content of the company's drilling average 36%. IOC's ore is said to run about 54%.

Doyle said that it would cost between $16-million and $20-million to complete a railroad covering the 30 mi connecting with IOC's line, to install beneficiating facilities to upgrade the ore to 65% and to otherwise equip the property for open pit production, slated to get underway late in 1956.

Dr. W. L. C. Greer, consulting geologist, made a survey of the Wabush Lake deposit for the Newfoundland government and was even more optimistic as to tonnage reserves. Dr. Greer said that "The large area and thickness of the orebody . . . (make) . . . for cheap mining and long life. It can be compared only with the Hull-Rush-Mahoning pit of the Mesabi Range which covers about the same area and which has produced to date well over 500-million tons of direct shipping ore."

Also at the press luncheon, Doyle announced acquisition in Chile of several sources of high-grade lump ore, necessary for open hearth smelting. The Javelin group in Chile is composed of Cia. El Inca de Minera Ltd., Cia. El Chango de Minera Ltd., Cia. El-Anacalufe de Minera Ltd. and Cia. El Desquitos de Minera Ltd. Administrator of this group is Joseph Sibley, Santiago.

## Synthetic Mica Plant Now Under Construction

SYNTHETIC MICA CORP., subsidiary of Mycalex Corporation of America, is building at Caldwell, N. J., what is described as the world's first synthetic mica plant. Production is to begin early in 1955.

Estimated annual output will be 1,000 tons of high-grade synthetic mica, about 5-10% of United States requirements.

## National Lead Expanding Argentina Plant Operation

NATIONAL LEAD CO., S. A., subsidiary of National Lead Co., New York, announced late last month that a major expansion is planned at its copper-lead-zinc property, Mina Castoña, in the Province of San Juan, Argentina.

Construction is expected to get underway Feb. 1 on the project which will include a copper-lead-zinc concentrator, power plant, pipe line and new housing for personnel. While company officials declined to discuss cost, it was reliably reported that the project will cost about $2-million.

When the new plant begins operations, in mid-1956, it will be capable of handling crude ore at the rate of 200 metric tpd. Concentrates will be shipped to National Lead's smelter at Puerto Vilelas. The smelted product then will be sent to a fabricating plant at Buenos Aires.

Mina Castaño is about 700 mi northwest of Buenos Aires. C. M. Merrell, president, National Lead Co., S. A., whose home offices are in the Argentine capital city, is in charge of operations.

## Aluminum Output Record

UNITED STATES ALUMINUM industry attained another all-time production record in the third quarter of 1954. Total third quarter production of 743,581,012 lb was greater than the previous all-time record of 732,660,294 set in the second quarter of 1954. Primary aluminum production during the first nine months of 1954 amounted to 2,174,378,648 lb.

## News Highlights

**Two small uranium rushes** have occurred in Alaska recently. **Page 124.**

**New Idria Mining & Chemical Co.** has revealed plans to develop its Moleno Mine at depth. **Page 126.**

**Wah Chang Corp.** has acquired the tungsten mill at Sugar Loaf, near Boulder, Colorado. **Page 129.**

**Jefferson Lake Sulphur Co.** of New Orleans has announced plans to construct a $3-million plant in southeastern Idaho. **Page 130.**

**Kaiser Aluminum & Chemical's** Baton Rouge plant is nearing completion of its $27-million, 3-yr expansion program. **Page 132.**

**Existence in northwestern Minnesota** of three major zones of abnormally high magnetic attraction which may indicate iron-bearing rock formations has been reported. **Page 134.**

**F. A. Vollmar,** Silver Peak mining operator, is said to be the first shipper of uranium in Nevada. **Page 136.**

**Operation of the new uranium** ore processing plant at Shiprock in New Mexico began Nov. 1. **Page 138.**

**Pacific Northwest Alloys Inc.** expects its $150,000 chrome concentrator at Coquille, Oregon, to be completed next month. **Page 139.**

**Noranda Mines** has begun production at its new sulphur-iron plant at Port Robinson, Ontario. **Page 146.**

**Operations are definitely rolling** at the northern British Columbia operation of Cassiar Asbestos Corp. **Page 148.**

**Association of Small & Medium Miners of Mexico** have spoken out strongly against confiscatory taxation, a basic problem of the Mexican mining industry. **Page 150**

**Export-Import Bank** is "prepared in principle" to lend $100-million to the Southern Peru Copper Corp. **Page 152.**

**Corporation Minera de Bolivia** laments that operations of the Nationalized Bolivian Mining suffered severe losses in 1953. **Page 154.**

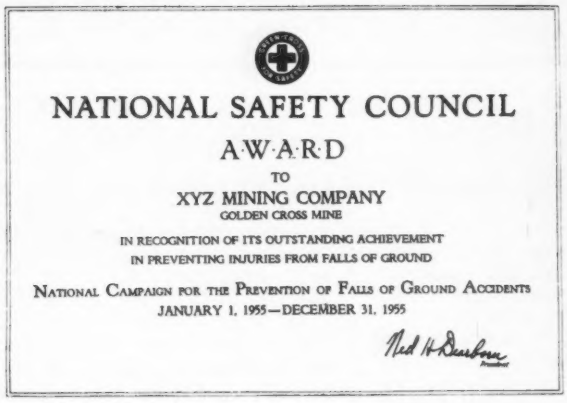
**A pilot plant study** of a new process for extracting nickel and cobalt from Cuban ores will result from an agreement just signed between GSA and Freeport Sulphur Co. **Page 156.**

**An Anglo-American group** is investigating a large iron ore deposit in the Putu Hills area of Liberia. **Page 159.**

**Boliden Mining Co.** in Sweden has begun operation of what has been described as the largest ore concentration plant in Europe. **Page 164.**

**Construction is to begin** this month of a new mill for Fluoruros, S. A., a leading fluorspar producer in Spain. **Page 166.**

**Hungary is helping** Czechoslovakia build an aluminum reduction plant. **Page 172.**


NATIONAL SAFETY COUNCIL

A·W·A·R·D

TO

XYZ MINING COMPANY

GOLDEN CROSS MINE

IN RECOGNITION OF ITS OUTSTANDING ACHIEVEMENT
IN PREVENTING INJURIES FROM FALLS OF GROUND

NATIONAL CAMPAIGN FOR THE PREVENTION OF FALLS OF GROUND ACCIDENTS
JANUARY 1, 1955—DECEMBER 31, 1955

**Your mine can win** one of these awards by participating in the campaign. See requirements listed below.

**Safe position** in taking down, "loose" is shown in film, "Bar It Down", part of campaign material available.

# Campaign to Cut Falls of Ground Injuries Opens

FULL-SCALE WAR on mining's number one killer will be waged by the National Safety Council in a campaign to prevent injuries and deaths from falls of ground —beginning Jan. 1, 1955.

Goal of the drive is the reduction of the annual killed and injured by 50%. About 420 non-coal miners die and 7,500 are injured annually by falls of ground, according to John L. Boardman, chairman of Anaconda Copper Mining Co.'s bureau of safety, and chairman of the new campaign. "Although we realize we are setting our sights high," says Boardman, 'we feel that this is the only way to attack a problem that results in death or injury to one out of 50 non-coal miners each year."

The campaign is sponsored by the mining section of the National Safety Council and endorsed by the U.S. Bureau of Mines, the American Mining Congress, state and provincial mining departments and mining associations.

Requirements for participation in the National Campaign to Reduce Falls of Ground Accidents in Mines are:

1) Companies that operate two or more mines must enroll each mine separately.

2) Each participating company agrees to provide the mining section with a simple report of injuries resulting from falls of rock and ore for the year, or two or three years, previous to 1955, depending on the period for which records are available.

3) Each participant agrees to send in a report of accident experience at the end of the first six months of the campaign and a final report covering the last six months. The campaign will end Dec. 31, 1955.

4) All non-coal mines in the U.S. and Canada may participate, providing 25 or more employees work underground.

The mining section will provide to participating companies a suggested plan for systematic use of materials and program planning. Each company will select materials and activities suitable for its own use. Membership in the section is not required and non-member companies will obtain Safety Council materials at member prices instead of the usual charge of double the member cost.

Some of the campaign materials available at member cost to participants include:

**Posters**—special series of 12 monthly posters, printed in heavy stock in two colors, dealing with safe practices in detecting loose ground, barring down, etc.

**Employee training booklets**—two-color booklets contain eight or nine important facts about falling ground accidents and major safety measures for prevention. New booklets will be distributed quarterly.

**Visual aids**—color film, "Bar It Down", is produced by the mining section and comes with leader's guide and safetygraph on falling rock hazards. Safetygraph, also produced by the section, is a convenient visual aid for teaching small groups. Second film, "Falling Ground", is sound-slide, produced by Anaconda Copper Mining.

**John L. Boardman,** chairman, bureau of safety, Anaconda Copper Mining Co., Butte, Mont., is chairman of the National Campaign for the prevention of Falls of Ground Accidents.

**Banners**—for use at the mine shaft entrance or collar or at a station, remind employees of the campaign and increase awareness of falling ground dangers.

**Publications**—data and information sheets will be provided for program leaders in the mines.

**Safety stunts**—for creating and maintaining interest in the campaign throughout the year are also available from the mining section's files.

National Safety Council, at the completion of the year-long campaign, will award a Certificate of Achievement (see photo, left above) to all participating mines which carry on a minimum of four safety activities and accomplish either a reduction of 50% in the frequency of injuries from falls of ground in comparison with the record for the previous period reported by the mine, or a record of no chargeable injuries due to fall of ground during the entire campaign year.

Further information may be obtained from the National Safety Council offices, 425 North Michigan Ave., Chicago 11, Ill.

Special campaign committee members are: Mr. Boardman; C. S. Gibson, safety director of Mines Accident Prevention Association of Ontario; A. J. Stromquist, safety director, Cleveland-Cliffs Iron Co., all past general chairmen of the mining section; Ivan Sloane, safety director, Canadian Johns-Manville Co. Ltd.; and Howard Rice, safety director, Southwest Potash Co.

# New Wyoming Mine, the Rich Lucky Mc, Attracts Attention of Uranium Seekers

A GROWING URANIUM BOOM in the Gas Hills district of Fremont County, Wyo., has proved the best "attention getter" to western mining in recent months.

The interest stems from a multi-million discovery made a year and one-half ago by Neil McNiece, operator of what he calls a "poor boy" oil well rig and equipment house at Riverton, 52 mi west of the uranium area.

Subsequently, McNiece incorporated the Lucky Mc Uranium Corp., in which New Park Mining Co. and affiliated firms of Salt Lake City, have substantial interests.

The operations on the McNiece claims are conducted under direction of a New Park staff, headed by William Henry Harrison Cranmer, a veteran western mining figure who started his career panning gold on Cripple Creek while a high school student.

The 73-year-old W. H. H. Cranmer is so enthusiastic about the Gas Hills district potential that associates in the Salt Lake mining fraternity sometimes look askance. But this has never bothered Harry Cranmer.

He says the Lucky Mc Uranium Co. controls more than 1,200 acres in claims, plus 2½ Wyoming school sections thus bringing the overall total leasings to 2,880 acres.

This is reportedly four or five times the holdings of other firms—such as the adjoining Sateco lease held jointly by Vitro Uranium Co., a division of Vitro Corporation of America and Pittsburgh-Rochester Coal Co.

Certainly the Atomic Energy Commission is interested in the apparent production potential of the area.

It drilled about 200 holes on the Lucky Mc claims. They all found mineralization. Some of the counts reportedly indicated 5-6% uranium oxide. A new buying station operated for AEC by American Smelting and Refining Co. will open in mid-February at Riverton.

The Lucky Mc group re-probed these holes, not satisfied with some of the logging conducted by the AEC. Most of the probes they obtained show from 10 to 20 ft or more of ore running between one and 4½% $U_3O_8$.

These probes were in the Wind River formation, much of which is exposed on surface of the fold.

The Wind River formation is composed of sandstone with shale streaks.

When Lucky Mc started its first major shipments back in September, the ore came from sections close to the surface which yielded the highest count on scintillators.

It was a shock to the operators to find that the Edgemont, S. D., buying station rejected all but two shipments as being below purchase specifications.

"It was then we found that we were getting out-of-equilibrium readings on the shallow ore," Cranmer says.

The stuff down deeper in the Wind River which seems to give a somewhat lower count, actually turned out to be of greater value.

The mining man says that the highest $U_3O_8$ values seem to be located in the denser sections of the sandstone segments of the Wind River.

This rock requires shooting. In the past, the three-quarters yard shovel scooped up everything—high grade, overburden and shales and loaded it into trucks for transport to the Riverton railhead.

Mining henceforth with mechanical loads will be somewhat more selective. But Cranmer believes the potential of the claim rests with taking the low grade with the high grade and mixing.

As the AEC drilling barely scratched the indicated ore area on the Lucky Mc claims and is back considerably from the face now being mined, the operators have started their own drilling program ahead of the ore.

Cranmer looks at the property as containing ore in the Wind River section running about .07 $U_3O_8$.

A property of the ore may lead to installation of mechanical concentration, he says, permitting upgrading on a 4-to-1 basis.

"It now appears that unlike the carnotite ores of the Colorado Plateau, the uranium at Gas Hills is formed not around the sand particles but between them," he says. It is on this theory he bases his belief that mechanical concentration will find application.

The White River lays over such sections of the Wind River formation which are not exposed.

Two other formations below the Wind River and exposed in draws cutting the fold are radioactive, containing uranium values, Cranmer says.

The carbonaceous Thermopolis shales below the Wind River have somewhat lower uranium values. Below these shales is a sand member, called the Cloverleaf formation—analagous to the Dakota formation. There is no count from the Cloverleaf.

Beneath the Cloverleaf is the Morrison section. And here ores similar to meta-autunite are found. They are low-grade, spotty to date.

In considering the potential of the area, it must be kept in mind that exploration has only really begun, Cranmer reports.

"The possibilities are tremendous," he reasons, with an eye to extended open pit mining tapping not only the Wind River but the Thermopolis shales and Morrison sections as well.

Both Cranmer and Robert M. Moran, Riverton attorney who is an officer of Lucky Mc Uranium Co., are shy about quoting an estimate of value of the mine.

"Why not talk about all the troubles we've had getting into production," says Moran.

An observer has been quoted as saying there was at least $14-million worth of ore available for the taking on the Lucky Mc claims.

Problems of shipment will largely be settled when the AEC opens its buying station at Riverton. For a while, the Lucky Mc shipped to the Rifle, Colo., plant of United States Vanadium Corp. which paid the freight on all ore running above 5% $U_3O_8$.

This ore traveled all the way into Nebraska, back to Denver and then via the Denver & Rio Grande Railroad Co. to Rifle.

It would have been simpler to ship to the Vitro Chemical Co.'s mill at Salt Lake City. But the "gateway" argument between the D & R G RR and Union Pacific Railroad Co. makes exchange of freight and establishment of rates in this connection difficult, Mr. Cranmer says.

It is the aim of the firm to obtain for its use seven side dump railroad cars of 70-ton capacity, each. Three cars would be on the way and three cars returning under this arrangement. The firm has been reluctant to load its Wind River ore in cars presently available because of danger of loss of fine material.

It is current program to lift production to 100 tons a day through use of a new-type Eimco loader. Should mechanical loading not meet the needs of the open pit, then the firm is considering a drag line.

An argument is easy to get in Salt Lake uranium circles as to the origin of the uranium in the Gas Hills district.

Armand J. Eardley, head of the Department of Geology of the University of Utah, recently surveyed the area with associates in Geo-Professional Services, Inc. and set value at at least $10-million.

Their report surmised that the uraniferous material came from the extensive volcanism in the Absoroka and Yellowstone Park area and that muddy streams draining this region spread volcanic ash and silt over the Wind River formation of central Wyoming.

Cranmer and some other geologists differ. They maintain that the solutions came up through faults clearly definable on the Gas Hills and subsidiary structures. From the faults, the material percolated through and into the Wind River section.

They point to existence of an area of fumarolic action northwest of the Lucky Mc claims as evidence of this theory.

Faulting seems to block certain areas of uranium deposition, they said.

Most of the structures have been heavily spotted with mining claims and location pits, as provided by Wyoming law.

# RIGHT AT HOME IN MINING CIRCLES

There's good reason why you see so much Naylor pipe in mining service. Whatever the job . . . for water, air or tailings . . . you can depend on this distinctive lightweight pipe to fill the bill, no matter how tough the going. Naylor pipe is easy to handle, easy to install. Because of its exclusive lockseamed-spiralwelded structure, it gives you extra strength and safety—performance that makes it right at home in mining applications. Write for Bulletin No. 507 on line pipe and Bulletin No. 513 on Naylor one-piece Wedge-Lock couplings.

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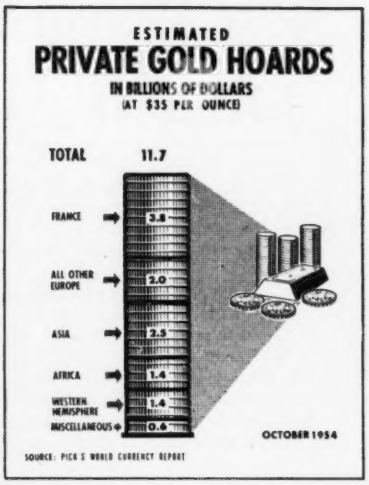



**Present hoards** are lower than 1953.

**Franz Pick, authority on international gold activity, estimates current gold hoards at $11.7-billion,** 6.4% below 1953's figure of $12.5-billion.

Pick's explanation for the change, first since 1938, involves sale of Soviet gold to the West and the resulting decline of free market prices; rise in stock markets in the Free World; and increasing belief in durable peace and pronounced currency stabilization.

Principal variations of private gold stocks show the following changes since 1951:

| | 1954 | 1953 | 1952 | 1951 |
|---|---|---|---|---|
| France | $3.8 | $4.0 | $4.0 | $4.1 |
| All other Europe | 2.0 | 2.2 | 2.1 | 2.0 |
| Asia | 2.5 | 2.4 | 2.0 | 1.8 |
| Africa | 1.4 | 1.8 | 1.9 | 1.8 |
| Western Hemisphere | 1.4 | 1.4 | 1.2 | 0.9 |
| Miscellaneous | 0.6 | 0.7 | 0.7 | 0.7 |
| Total | $11.7 | $12.5 | $11.9 | $11.2 |

Present gold hoards, Pick says, represent 14 yr of total known production, and correspond to 34% of all official monetary gold stocks. Size of the hoard, according to the expert, indicates world-wide distrust of paper money and currency control.

## Kitimat Enlarges Capacity

ALUMINUM CAPACITY at Aluminum Ltd.'s Kitimat, B. C., plant will be expanded by 60,000 tons per year according to Nathanael V. Davis, president. A fourth generator for the powerhouse at Kemano, with a 140,000 hp capacity, was authorized by the company. Original construction provided for an aluminum capacity three times the original level (see *E&MJ*, April 1954, p 78).

## Mining Calendar

**National Western Mining Meeting and Annual Meeting, Colorado Mining Association,** Feb. 3-5, Denver.

**AIME, Annual Meeting,** Feb. 14-17, Hotel Conrad Hilton, Chicago.

**Ninth Western Metal Congress & Exposition,** Mar. 28-Apr. 1, Pan-Pacific Auditorium, Los Angeles.

**TWELVE YEAR TD-14 PERFORMANCE RECORD** prompts Acme to put 2 new TD-14As on expanded operations. Here one of new tractors dozes blasted limestone for shovel loading into haul trucks far below surface.

# "We Worked Our TD-14 12 Years Before Trading"

## Says E. H. Warren, superintendent of Acme Limestone Company's underground mine

The Acme Limestone Company, Fort Spring, West Virginia, got the low-down on durability and performance of INTERNATIONAL crawlers by working a TD-14 for 12 years piling up blasted limestone for a shovel in its underground mine.

With Acme expanding operations, this ancient crawler that took the pounding on the roughest, toughest assignment imaginable has now been replaced by two INTERNATIONAL TD-14As and dozers. They produce approximately 150 tons hourly from a 21-foot seam of high calcium limestone.

Superintendent E. H. Warren says, "*We have been 100%* INTERNATIONAL *on crawlers since 1942 with our first TD-14 working 12 years before being traded. The all-around production and service we get from* INTERNATIONALS *speaks for itself when we buy more as replacements.*"

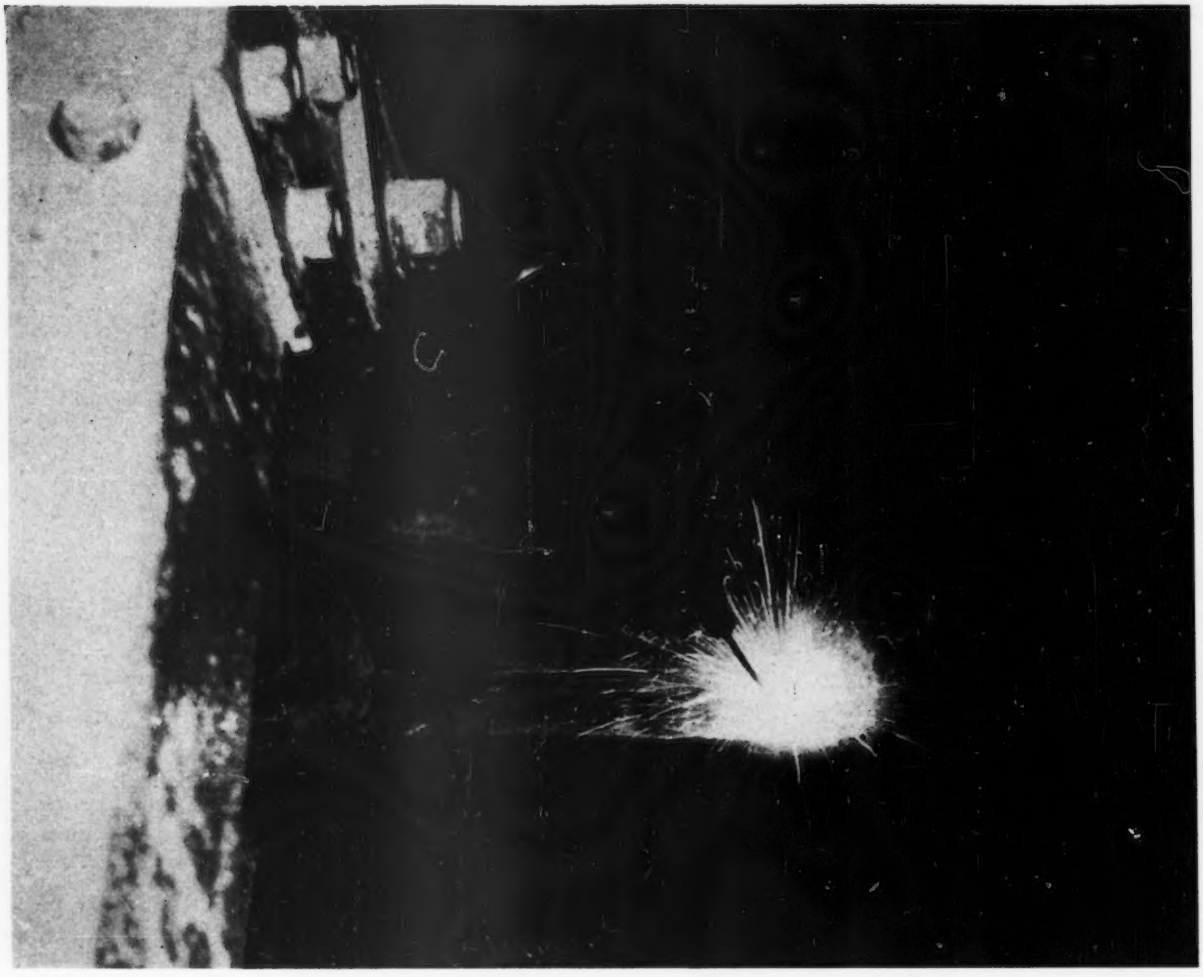
For a long-term, dividend-producing investment in pit or quarry crawler tractor power, see your International Industrial Power Distributor. He'll demonstrate any of the seven INTERNATIONAL crawlers equipped to do your work. Then you can see for yourself how these machines pay off with peak production in handling rock, gravel or sand at less cost.

**INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.**

**INTERNATIONAL**
**INDUSTRIAL POWER**

**MAKES EVERY LOAD A PAYLOAD**

INTERNATIONAL HARVESTER



*Crusher rolls such as this can be rebuilt with Stoody Magnecote in about half the time with a 30% saving in material cost. Service life is usually twice that of a new roll.*

# THE STORY OF STOODY MAGNECOTE

**A new build-up and hard-facing process that deposits weld metal faster, cuts labor and overhead costs**

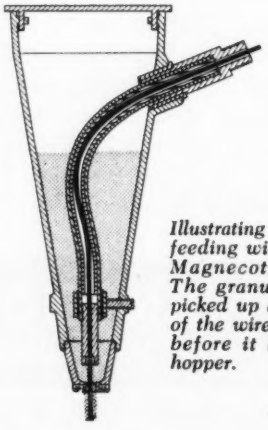
Stoody Magnecote is a new method for making high speed weld deposits. It possesses all the flexibility of manual welding with greater speed than automatic welding. Magnecote's primary applications are building up and hard-facing heavy equipment, crushers of all types, shovel parts and similar heavy sections. Because of its great speed—conservatively 3 times faster than manual welding—*far more work can be accomplished within a given time, labor and overhead costs are reduced accordingly.*

Using an annealed $\frac{3}{32}$" or $\frac{5}{64}$" .60-.70 high carbon wire as an electrode, deposit analyses can be varied, simply by changing the granular magnetic flux. At present, four Magnecote fluxes are available covering build-up and hard-facing requirements.

## HOW STOODY MAGNECOTE OPERATES

The Magnecote process is applicable to all present semi-automatic welding machines. It needs only the addition of a Stoody Magnecote Hopper for feeding the flux.

Welding current passing through the bare wire (electrode) develops a magnetic field. Flux granules within the hopper are magnetically attracted to the wire, forming a uniform coating. When the arc is broken and the wire ceases to feed, small permanent magnets in the tip dam the flow of flux.



*Illustrating method of feeding wire through Magnecote hopper. The granular flux is picked up at the base of the wire guide just before it leaves the hopper.*

### THE 4 MAGNECOTE FLUXES

**MAGNECOTE 301**—A build-up material producing Hadfield manganese deposits.

**MAGNECOTE 304**—A machinable build-up material for use on carbon or low alloy steel equipment.

**MAGNECOTE 305**—A hard-facing alloy having high abrasion resistance and good impact strength.

**MAGNECOTE 302**—A hard-facing alloy having high impact strength and good abrasion resistance.

*Welding time on this Hammermill Hammer was cut in half with Stoody Magnecote. It was first built up then hardfaced for maximum life.*

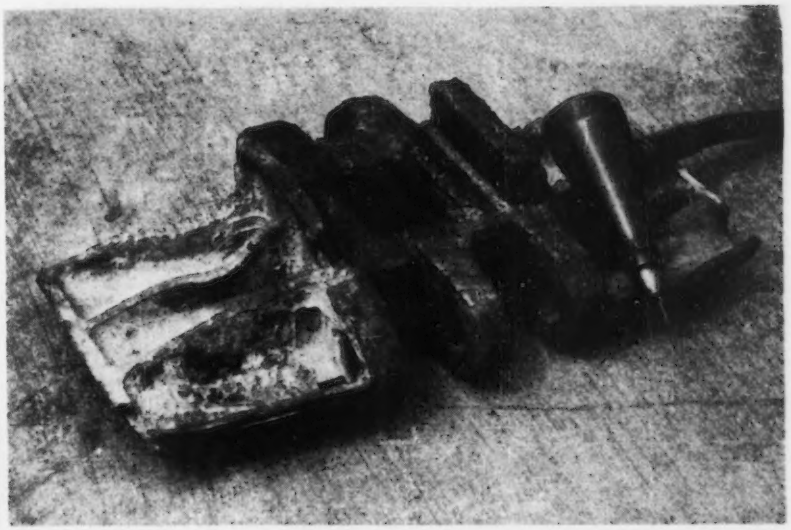
### MAGNECOTE PROCESS OFFERS MANY OTHER ADVANTAGES

Flux dams are unnecessary—all flux is consumed. There are no flux recovery or grinding problems. Since the shielded arc process is employed, the work is visible to the operator at all times. Welding is continuous—no stub end losses. Material costs are lower than for comparable manual electrodes. Appearance of deposits gives a good indication of weld quality. Deposits are remarkably uniform, sound and free from porosity.

Multiple passes are made with ease. Amperage ranges from 200 to 350.

### UNUSUAL WELDING SPEED CUTS COSTS

Considerable field work has now been completed using Stoody Magnecote on production work. The following are typical of results obtained on CRUSHER ROLLS:



*Manganese Shovel Track Pads are built up with Magnecote 301. Two finish passes of Magnecote 305 insure extra wear resistance. Probable service life—50% more than replacement parts.*

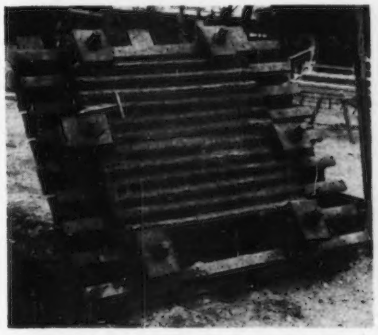
**Case No. 1:**

*65 lbs. of Magnecote 302 were deposited in 5½ hrs. In comparison, using the two-rod filler method, 40 lbs. were deposited in 8 hrs.*

**Case No. 2:**

*On a 40" O.D. roll with a 22" face, 180 lbs. of Magnecote 301 were applied in 18 hours. The job was completed with a final pass of Coated Tube Stoodite. Total build-up: 1¼" on diameter.*

On a conservative basis where a welder deposits 3 to 4 lbs. per hour by manual methods *he can now lay down from 8 to 12 lbs. per hour with Magnecote. Combined savings in labor and overhead easily amount to several dollars per hour.*



*This Crusher Jaw has manganese rounds tack welded in place to form corrugations, then entire face is rebuilt with Magnecote 301. Final passes of Magnecote 302 extend service life as much as 2 to 1 over new jaws.*

*Stoody Magnecote excells on heavy equipment such as this Dredge Pump Casing where extensive buildups are required. Magnecote 301 restored size, Magnecote 302 provides an excellent final hard facing overlay.*

Although best adapted to welding in down-hand position, the method is also applicable to inclined work by building a shelf and welding upwards.

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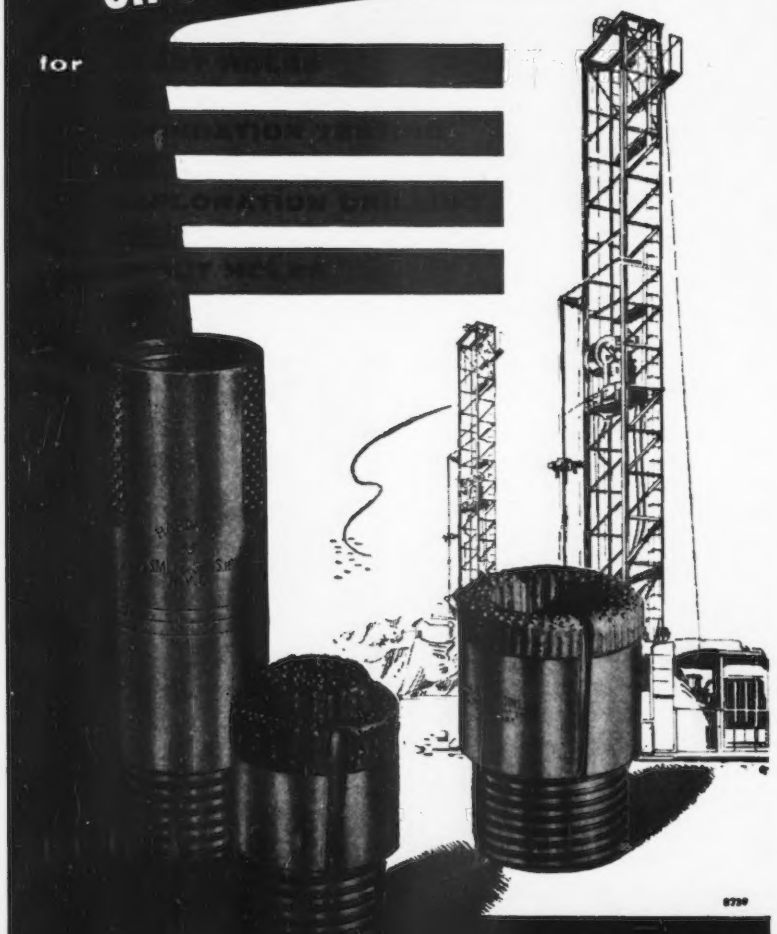

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# IN THE U.S.

## ALASKA

**Fire at Red Devil quicksilver mine of DeCoursey Mountain Mining Co.** Oct. 22 shut the mine and caused extensive damage. Only the bunk house, cook house, office, and oil tank escaped.

**Organized exploration with qualified field parties greatly increased** during 1954, particularly in the southern part of the Panhandle. With the approach of winter most of the activity has been suspended.

The following companies were active in the First Division during the past season: Coast Range Exploration Co., Anchorage, Alaska; W. S. Moore Co., Duluth, Minnesota; Northwest Ventures, Ltd., Vancouver, B. C.; U. S. Steel Co.

**Two small uranium rushes have occurred in Alaska lately.** The first, in mid-October, was centered about Shirley Lake near the Skwentna River 110 mi northwest of Anchorage. A definitely radioactive area was found, but commercially-important samples had not yet been uncovered.

Second flurry of interest was in the Nixon Fork country near McGrath. A U.S. Geological Survey report published in 1949 pointed out that this area had uranium possibilities.

**U.S. Tin Corp.'s operation at Lost River reportedly is currently milling more than 100 tpd.** The operation made its second shipment in October, about 130 tons of tin ore valued at some $150,000. First shipment last August was valued at about $200,000. Both loads of ore were sent to U.S. Government-owned Longhorn Smelter at Texas City, Texas.

This Lost River operation, about 60 mi north of Nome on the Bering Sea, is the only all-year underground operation in that part of Alaska.

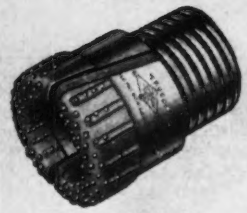
**The 6 cu ft dredge, equipment, buildings,** and placer ground formerly owned by Livengood Placers at Livengood has been purchased by the U.S. Smelting Refining and Mining Co., Fairbanks Branch.

## ARIZONA

**Arizona was left with only two major underground copper mines**—the Magma at Superior and the new San Manuel—when Ray division of Kennecott Copper Corp. closed its historic No. 2 mine in late October.

The mine was in continuous production for more than 43 years, according to A. P. Morris, general manager of the division. Since opened, it has produced over 64-million tons of copper ore.

The No. 2 mine reached a level where ore did not contain enough copper to warrant high cost of maintaining underground operations. About 80 underground workers lost jobs in the shutdown. Others were switched to the open pit operation, leaving a total work force of about 775 as compared to 850 before the closing.



TRUCO CORING BIT

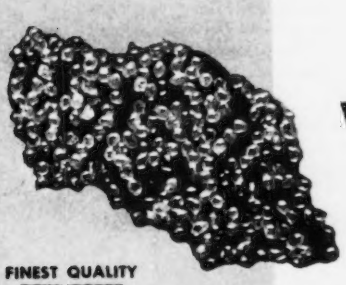
TRUCO CONCAVE BLAST HOLE BIT

TRUCO PILOT BIT

TRUCO IMPREGNATED CORING BIT

TRUCO REAMING SHELLS

TRUCO STANDARD OIL FIELD BIT



FINEST QUALITY DRILL BORTZ

# The Man Who Swallowed a Fortune

"Here," shouted Seigneur de Sancy to his bodyguard. "Here are the marks of the melée. Find my poor Pierre and there, I know, you will find the diamond."

When they found the grave in the forest, they found, too, that the brave old retainer, carrying the great jewel to King Henry IV of France (so that he could pawn it to finance his armies) had foiled the robbers at the cost of his life. When his stomach was slit open, there lay the Sancy diamond.

For lending his diamond to France, Henry made de Sancy ambassador to the court of Queen Elizabeth of England, who liked the jewel so much that she bought it. It passed to Charles I, who lost his head on the block, and, later, to James II, who fled to France after a disastrous defeat and sold the Sancy to Louis XIV for $125,000—a fancy price in those days for a diamond of 53½ carats.

During the Revolution, it was stolen with the Crown Jewels of France, found weeks later in a gutter in the Champs Elysées, quickly stolen again, re-discovered in 1828 when it was sold to Prince Demidoff of Russia for $100,000. Today, it is said to be back in India, where it was originally found, probably a thousand years ago.

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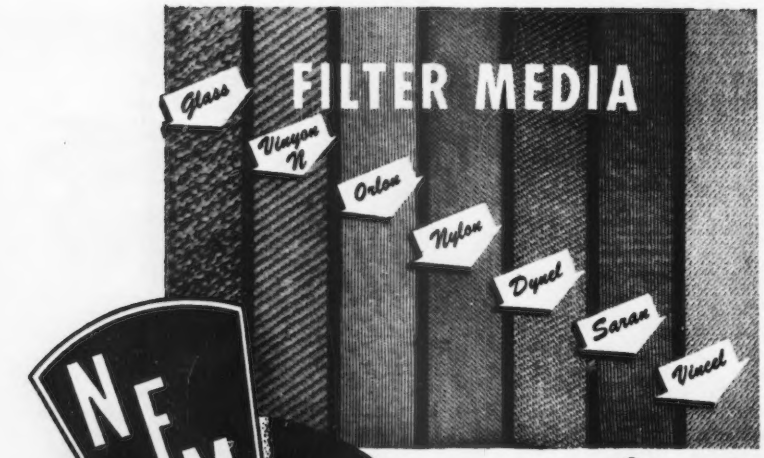


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## Arizona *(Continued)*

**Twenty-one uranium claims in the Cherry Creek area** of the Sierra Ancha district near Globe have been sold to Western Mining and Exploration Co., an Arizona corporation, for a reported $800,000.

**Air searching of more than 9-million acres in Arizona, New Mexico, and Texas** is being conducted under sponsorship of the Tovrea Land and Cattle Co. at Phoenix. Uranium orebodies are the prime objective of the search.

## CALIFORNIA

**Miracle Springs Mining Co. has been organized to develop the uranium property** at Miracle Hot Springs (Kern County) recently purchased by Wyoming Gulf Sulphur Co. The new company is owned by Wyoming Gulf Sulphur.

Acting manager of the mine is M. S. Patterson. He recently conferred with two New York representatives of Wyoming Gulf Sulphur—M. W. Ditto and Harry L. Wolf—on development plans.

The company hopes to be ready to award a contract for drilling early next year, according to Ditto. He said horizontal drilling will have to be done, unlike most properties on the Colorado Plateau. An adit tunnel begun by original owners of the property, Miracle Mining Co., will be continued, and another tunnel will be started on the same formation, Ditto said.

Ditto estimated the company will hire 40-50 men as soon as "we finish the red tape." Work has been delayed because the company has to construct certain buildings to conform with the state mining law, but it can't start building until the U. S. Forestry Department approves its application. The mine is located in a forest reserve.

Ditto said the company probably will ship ore to the Vitro plant in Salt Lake City.

One shipment of ore from the property was made before the change in ownership.

**New Idria Mining & Chemical Co has revealed plans to develop its Moleno Mine at depth.** The Moleno property adjoins the company's New Idria quicksilver mine at Idria, in San Benito County. Work at Moleno will be financed by part of a $121,000 DMEA loan obtained in August. Once a good quicksilver producer, the Moleno mine has been shut down for some 40 years.

The company announced also formation of a new division which will operate mines for other companies. The new venture was approved by the board of directors.

**California Quicksilver Mines Inc. has been trying out a new battery-operated hammer** at Abbott Mine 15 mi east of Clear Lake, reports the California Division of Mines.

**Current interest in the uranium potential of the Mojave Desert,** sparked by the Miracle Mining Co. discovery, under-

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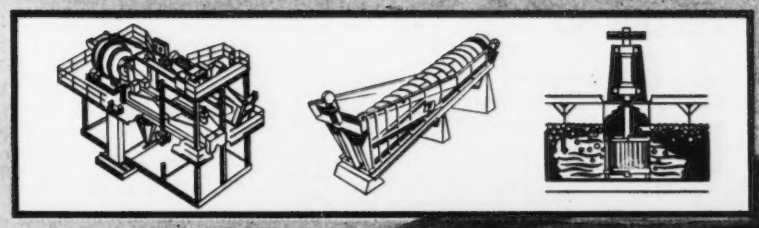

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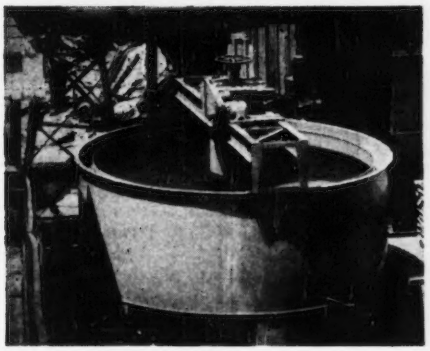

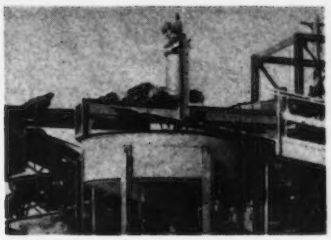

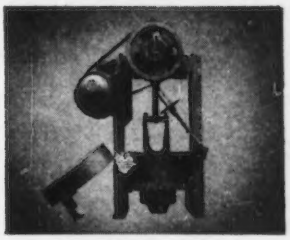

### WEMCO THICKENERS:

**Sizes and Types:** WEMCO Thickeners are job-tailored to specific applications and are available in sizes up to 400′ diameter. Job requirements determine use of Beam (up to 45′), Lo-Truss (32′ to 60′), Hi-Truss (60′ to 100′), Center Pier (75′ to 175′) or Traction (125′ to 400′) type of construction.

**Features:** Depending on application, WEMCO Thickeners offer a wide choice of construction and mechanical features. These include: heavy duty worm or spur gear mechanisms and bearings; large feed wells; strong cast spiders; overload alarms; manual or motorized screw lifting devices on small sizes; vertical hydraulic lift on Center Pier type; chain and sprocket gear-motor drive on small sizes; dual fluid drive on Center Pier and Traction types; large diameter discharge cones; wood or steel tanks.

### WEMCO HYDROSEPARATORS:

**Sizes and Types:** WEMCO Hydroseparators are available in sizes up to 100′ diameter. Duty requirements determine use of Beam (up to 40′), Lo-Truss (35′ to 55′), or Hi-Truss (55′ to 100′) type of construction.

**Features:** Depending on job requirements, WEMCO Hydroseparators offer a wide range of construction and mechanical features, including: heavy duty worm gear mechanisms and bearings, large diameter cold rolled steel shafts, large feed wells and discharge cones, strong cast spiders, manual or motorized lifting devices and efficient drive arrangements.

### WEMCO DIAPHRAGM PUMPS:

**Sizes and Types:** WEMCO Diaphragm Pumps are available in 2″, 3″ and 4″ sizes. Each size can be obtained in either simplex, duplex or triplex arrangements.

**Features:** WEMCO Diaphragm Pumps are designed and built for efficient, trouble-free operation. Features include: Rugged welded steel frame, uniformly weighted rubber ball valves, rubber valve seats, long wearing rubber diaphragm, adjustable stroke and indicator, handwheel-operated variable speed drive for speed adjustment while pump is in operation.

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## California *(Continued)*

lines a study of the area by the U.S. Geological Survey.

Four likely uranium areas were noted: Rock Corral area, an 80-sq mi section 50 mi northeast of San Bernardino; Searles Station area, 28 sq mi section north of Randsburg in northeastern Kern County; Soledad Mountain area, a 50 sq mi section south of the town of Mojave in southwestern Kern County, and the White Tank area, a 30 sq mi section on the boundary beween San Bernardino and Riverside counties, partly in the Joshua Tree National Monument.

**Autunite has been discovered in clay beds** on the Green Velvet claim a few miles east of Olancha in Inyo County.

## COLORADO

**Ore production from the Atkinson Mesa lease near Uravan has continued on a satisfactory basis the past three months,** says Golden Cycle Corp. of Colorado Springs, the operator.

In order to insure long-time, continuous production, it has been and will be necessary to do a considerable amount of exploration work. New headings have been opened which will make it possible to use a larger crew of miners; additional drifts are being driven toward drill holes which had good ore showings; and as a result of these operations Golden Cycle expects increased production during the months ahead. In addition to a relatively small lens of high grade ore, they have opened up a large thick lens of low grade ore which, by mixing the two, will make it possible to ship a good average grade of ore and insure steady production, an official said.

**A petrified log from Fremont County, Wyoming, has been sold for nearly $3000.** The reason: It was loaded with uranium (see *E&MJ*, June 1954, p 122). The Green River Uranium Co. shipped the tree, weighing 4,650 lb to Salt Lake City where it was sold for $1,200 a ton, the company reports.

Uranium bearing minerals seeped into the pores of the tree until the wood was almost completely replaced. The rich log came from the Gas Hills area southeast of Puddle Springs. Its exterior assayed as high as 42.7% uranium. The center, however, contained little or no ore.

**Uncompahgre Uranium Co. is now mining uranium at Idaho Springs,** in the Virginia Canyon area. Holdings are approximately 20 claims. The bulk of the ore is apparently low grade, with an average of about 0.15%. However, assays of as much as 6% have been taken.

The company has successfully milled 50-odd tons and hopes to be able to continue with an expanded milling program. Donald R. Malleck, Grand Junction, is vice president and general manager.

**Excavations are under way at Rico for the $1.5-million sulphuric acid plant being constructed** by the Rico Argentine Mining Co. The work is being done under contract by Leonard Construction Co., a Monsato Chemical Company subsidiary.

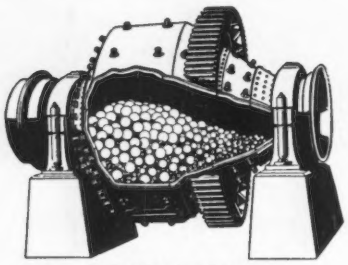
The facility will transform about 400,000 tons of lead-zinc mill tailings, contaning about 50% sulphur into sulphuric acid.

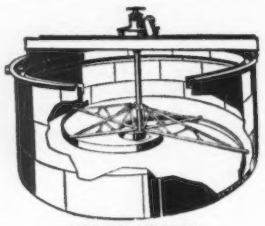
After the tailings are exhausted, reduction of 25-million tons of proved pyrite ore reserves will start. When completed, the Rico plant will turn out 150 tons of acid daily. Most of the production will go to Colorado Plateau Uranium mills. S. Hinckley of Rico is manager.

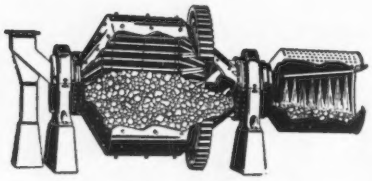
**George Friden prospected for uranium through six states for 18 months without turning up paydirt** and then struck it rich within 20 minutes drive of his Lakewood home.

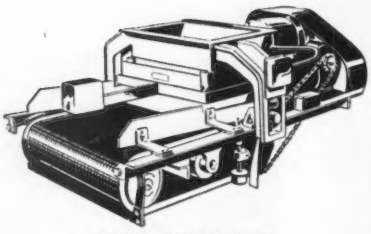
Friden's find is in the first range of foothills a mile north of Golden Gate Canyon and a mile west of Golden. This new uranium strike is almost within sight of downtown Denver, shows promise of being one of the richest in the West.

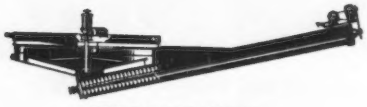
An assay by the U.S. Bureau of Mines



CONICAL MILLS


"AUTO-RAISE" THICKENERS
(Beam-supported type)


CONICAL ORE SCRUBBERS


CONSTANT-WEIGHT FEEDERS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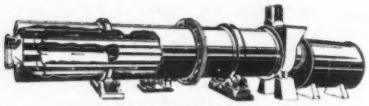
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on 10 samples of ore averaged better than 16% uranium oxide. the high batch running better than 23% and the low nearly 9%. One hand-picked sample from the center of an outcrop where Friden believes the main body of ore lies assayed an unbelievable 56%. Even the soil around the ore samples was said to run .08% uranium oxide.

**Minerals Engineering Co. has completed negotiations and is taking over operations of the Baltimore Camas tungsten mill** at Ely, Nev., says Blair Burwell, president of the Grand Junction engineering and mining firm.

**Another million-dollar uranium transaction was completed in Grand Junction** with the sale of the entire assets of the Gateway Mining & Development Co. to Flanders Mining Co. for $1,250,000. The properties acquired by Flanders include approximately 150 claims on Beaver Mesa, about 8 mi west of Gateway, Colo.

Claims are partly in Mesa County and partly in Grand County, Utah. Flanders has opened an office in Grand Junction with W. M. Spencer, Jr. in charge.

**Kuo Ching Li as chairman of the Board of the Wah Chang Corp., has acquired the tungsten mill** at Sugar Loaf above Boulder. Wah Chang will use the Sugar Loaf mill to concentrate ores of all grades mined locally. The mill previously was the property of Boulder Tungsten Mines, Inc., which processed ore during World War I and later.

**Climax Uranium, a subsidiary of Climax Molybdenum Co., reports its mill for processing uranium ores will be doubled** in capacity in a million-dollar expansion program. Climax has signed a new 5-yr contract with AEC providing for the increase in milling facilities there.

The contract was signed in Grand Junction by John H. White, Jr., former president of Climax Uranium (see Personal News), and Sheldon P. Wimpfen, manager of the Grand Junction operations office, AEC.

Engineering work for the expansion has been done by Associated Engineers of Denver and "is so far advanced that construction will begin at once," Climax announced. The new facilities will be completed and put into operation "inside of nine months," the firm announced.

**Minerals Mining & Milling Co. has begun operation of its mill at Rico,** milling a lead-silver concentrate. At full capacity the mill will handle 100 tons daily. Ore is coming from property leased by Minerals Mining from the Union Carbide & Carbon Co.

**Golden Cycle Corp. announced plans for drilling on 2,000 acres of uranium land** on Monogram Mesa in Montrose and San Miguel Counties. The company has been producing ore on its Atkinson Mesa lease near Uravan, the report said, and a considerable amount of exploration work is planned there.

**D. W. Viles, vice president of the Vanadium Corporation of America,** said the VCA mine on Hermosa Creek, 45 mi north of Durango, will be in full operation by spring. Development work on the mine, expected to become one of the major VCA properties, has been in progress for several years.

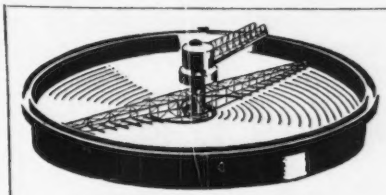
Employees at the VCA mill in Durango voted against representation by the CIO United Steelworkers in elections Nov. 3.

## IDAHO

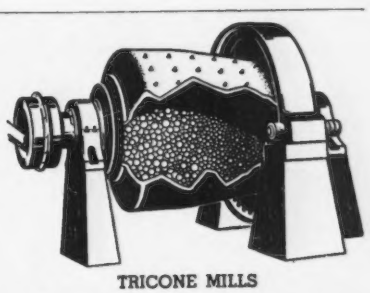
**Sunshine Mining Co. has opened the Chester and No. 8 veins on the new 3850 level** at its big mine in the silver belt of the Coeur d'Alene Mining District and found ore comparable in grade with that on the 3700 level immediately above.

**Sun Valley Mining Corp., a new Blaine County company actively developing** a merged group of 18 old mining properties west of Hailey, reports substantial progress and encouraging results.

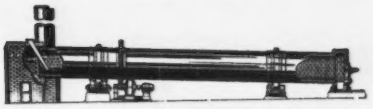
**Wage negotiations were concluded in the Coeur d'Alene District during October** with a settlement that is believed to be the highest in the non-ferrous min-

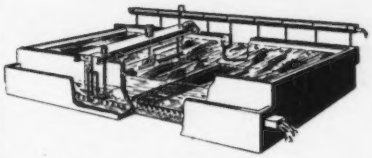
"AUTO-RAISE" THICKENERS
(Center-column type)



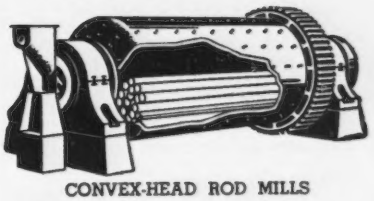
TRICONE MILLS



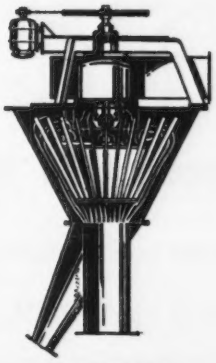
RUGGLES-COLES
ROTARY AND SHAFT KILNS



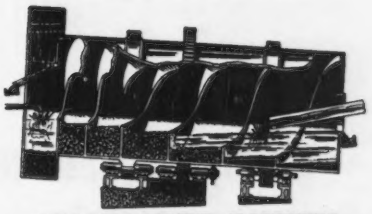
AUTOMATIC BACKWASH
SAND FILTERS



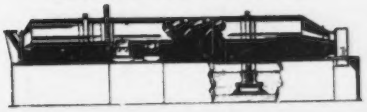
CONVEX-HEAD ROD MILLS



"GYROTOR"
AIR CLASSIFIERS



COUNTER-CURRENT CLASSIFIERS
HEAVY-MEDIA SEPARATORS



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# NOW—

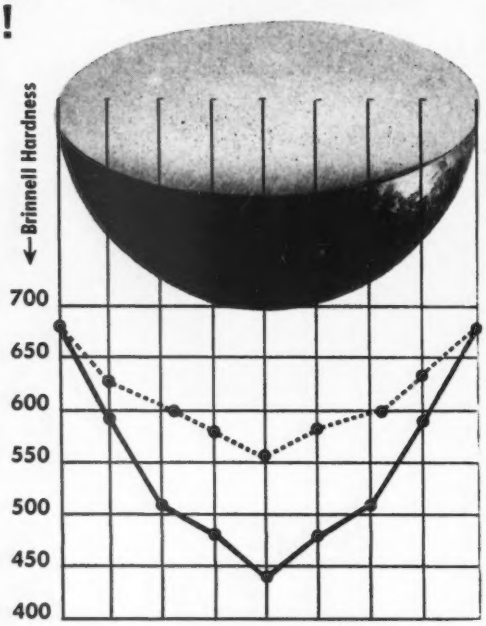
## ALLOY BALL PERFORMANCE AT CARBON BALL PRICE

## AFCO "IC" (improved carbon) FORGED STEEL GRINDING BALLS

Forged from AFCO's new improved carbon steel, AFCO "IC" deep hardened grinding balls offer deep, penetrating hardness comparable to many types of costly alloy balls—yet they are priced competitively with media forged from ordinary carbon steel.

## COMPARE...You'll see why AFCO "IC" Balls are YOUR Best Buy!

Here are hardness curves developed from actual tests on AFCO "IC" deep-hardened 4" ball (solid line), and a 4" alloy ball (dotted line). Note how the AFCO "IC" gives you such alloy-type characteristics as high average volumetric hardness and deep penetration with a "tough" center—at substantial savings in cost.




## Cut Grinding Costs NOW—Specify AFCO "IC"

Get Your Grinding Costs Down—
Specify AFCO "IC" deep hardened grinding balls for your mill now!
Available in ¾" to 5" diameters.
For details, prompt quotations, phone, write or wire TODAY.

## AMERICAN FORGE COMPANY

9

Executive offices and plant: Niles, California . . . Phone Niles 3311
Sales offices: 101 Park Ave., New York City; Portland, Oregon; Los Angeles, Calif.; Salt Lake City, Utah.

AFCO PRODUCTS


## Idaho *(Continued)*

ing industry this year, it was reported.

The pattern was set by the agreement reached between Bunker Hill & Sullivan Mining & Concentrating Co. and the International Union of Mine, Mill & Smelter Workers.

**Bunker Hill & Sullivan Mining & Concentrating Co. has completed more than 1400 ft of crosscutting** on the new 3200-ft level at its Crescent Mine on Big Creek between Wallace and Kellogg since the shaft-sinking project was completed last May.

**The first exploratory test hole drilled by National Uranium Corp. of Wallace** on the Needle property in the Big Indian District of San Juan County, Utah, cut one foot of good uranium mineralization at a depth of 768 ft in the Chinle formation. Further test work is now in progress.

**Lucky Friday Silver-Lead Mines Co. has pushed its new three-compartment shaft raise to the 900 level** and is advancing the heading at the rate of about 100 ft a month. It will be run through to the adit level to provide more adequate hoisting facilities for the deep mining operation in the Coeur d'Alene district east of Mullan.

**Sunshine Mining Co. and Polaris Mining Co. late in October reduced the work-week at their mining operations** in the silver belt of the Coeur d'Alene District from 48 hr to 40 hr. Cost increases resulting from the recent wage boost were said to have necessitated the cut-back.

**Jefferson Lake Sulphur Co. of New Orleans has announced plans for construction of a $3-million plant** in southeastern Idaho, probably Bear Lake County, to utilize the area's vast phosphate deposits in the manufacture of triple superphosphate fertilizer.

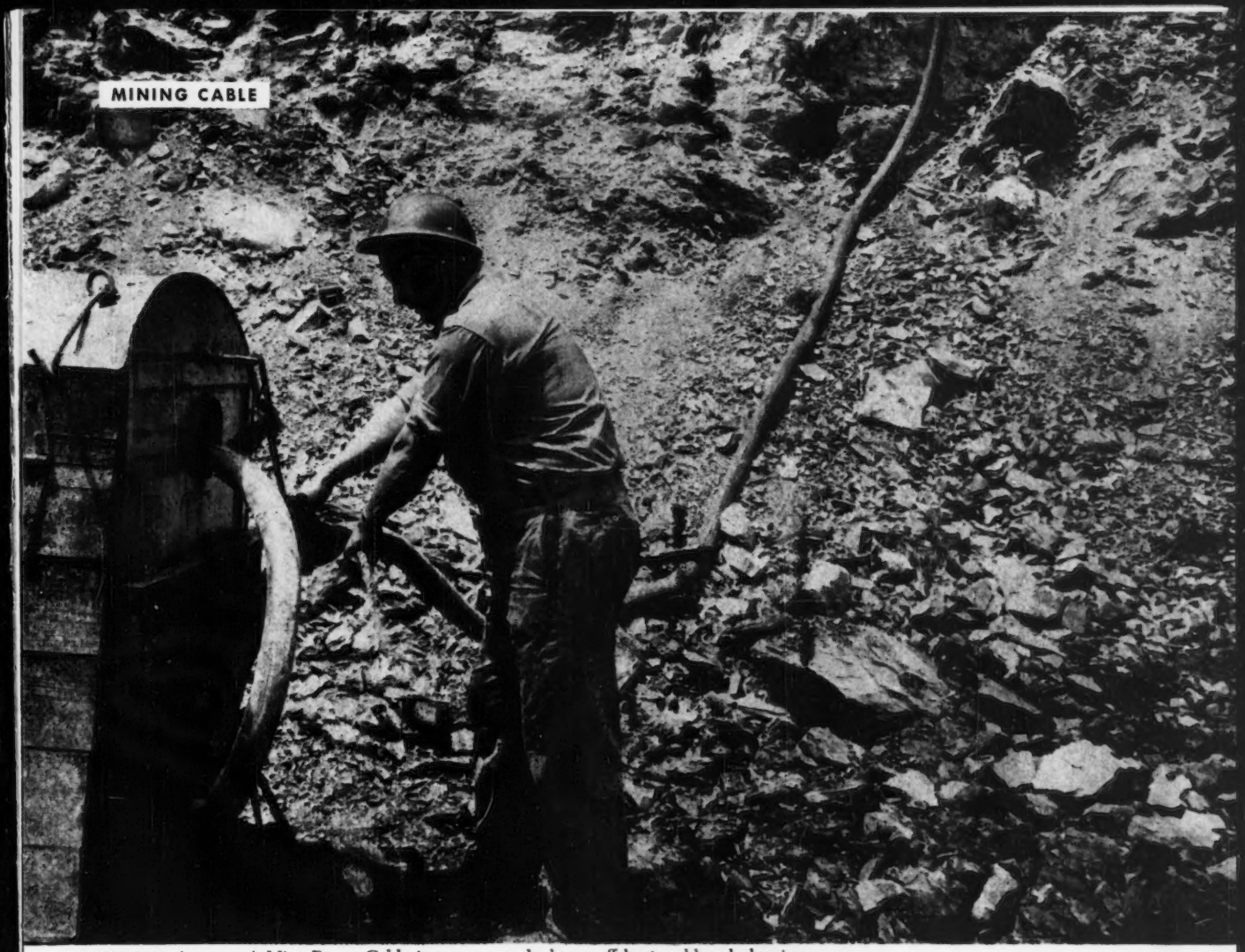
An 80,000-ton-per-year plant already is on the engineering boards and construction is expected to get underway before the first of the year. It will utilize the sulphuric acid "wet process" and will include a unit for converting sulphur to sulphuric acid. About 80 men will be employed.

Jefferson Lake has been producing sulphur for about 25 yr, and the new plant is said to represent a diversification of interests.

Idaho's phosphate-processing industry has been growing by leaps and bounds during the past 10 yr and today represents an investment of nearly $100-million.

**Silver Star-Queens Mines Inc. is developing a 6- to 7-ft width of good milling ore** along the Queen footwall vein on the 450-ft level of its Queen of the Hills Mine near Bellevue, officials report. A raise on the ore has been advanced more than 50 ft. Exploration of a large, well-mineralized shear zone in the hanging-wall vein is also in progress.

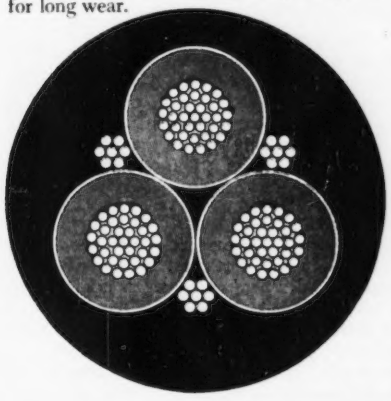
**The core-drilling program of U. & I. Uranium Inc. of Kellogg on its Radon**




**IN OPEN PITS,** ANACONDA Mine Power Cable is more rugged, shrugs off heat, cold and abrasion.

# AnacondA Butyl-insulated Mine Power Cable gives longer "trouble-free" service

**ANACONDA'S MINE POWER CABLE . . .** It has butyl insulation and a tough neoprene jacket for long wear.



**ONE BREAK** in an ordinary cable can cost you more than you can possibly save buying on price alone!

A broiling hot sun. Ragged rocks. Corrosive mine water. These are good reasons you need a tough power cable.

### How Anaconda builds a tougher cable

First, in making Anaconda's Mine Power Cable, we use butyl insulation. This special insulation resists heat, moisture and ozone, and has high dielectric strength.

Over the insulation goes a jacket material — a tough neoprene compound. It's flexible . . . strong . . . resists flame, heat, moisture, oil and grease, and corrosive mine water.

### What's the benefit to you?

Users tell us ANACONDA Mine Power Cable lasts longer—with fewer power interruptions, less maintenance trouble. And it saves them money.

Why not see for yourself. Ask your Anaconda Sales Office or Distributor to show you a sample of this superior mine power cable. *Anaconda Wire & Cable Company, 25 Broadway, N. Y. 4, N. Y.*

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**ANACONDA®**

*Flat-twin cables for: shuttle cars, continuous miners, loaders, cutters, drill trucks • Hi-volt cables for mine power. Type SH-D for shovels • Type SO and heavy-duty drill cords for hand drills, remote control • trolley wire • feeder cables • telephone wire • shot fire cord • welding cables.*

# Neither dust–rain–heat nor snow...

This 600 RT Cleveland worm gear speed reducer drives a feeder which delivers limestone to a 30" x 42" jaw crusher. Photo courtesy of St. Paul Quarries, Inc., St. Paul, Ind.

# stops a CLEVELAND drive

COATED with dust—exposed to Nature's worst—this rugged Cleveland has never faltered as it drives a 4 x 14 ft. apron feeder at an Indiana rock plant.

Cleveland is an ideal drive for the mining industries because it has a minimum number of moving parts, *all totally enclosed* in a dust-and-moisture-tight housing. Even under the most trying conditions, a Cleveland operates efficiently because worm and gear are accurately matched during manufacture to run smoothly. Cleveland's ability to "take it" is demonstrated by the scores of old units throughout industry still working satisfactorily after 30 to 40 years of continuous service.

That's why we say, "Look to Cleveland," if you want a *really* dependable worm gear drive. Every drive is backed by Cleveland's 42 years of leadership in worm gear manufacture. Write for your free copy of Catalog 400 for complete engineering data. The Cleveland Worm and Gear Company, 3281 East 80th Street, Cleveland 4, Ohio.

*Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.*

CLEVELAND
Worm & Gear
*Speed Reducers*


## Idaho *(Continued)*

**property** in the Big Indian district of San Juan County, Utah, is proving what appears to be the largest uranium orebody found thus far in that highly-productive area. By the end of Oct. 23 test holes had been completed and an orebody over 1800 ft long, with widths up to 400 ft and thickness up to 26 ft, had been outlined, lying at a depth of about 700 ft below the surface.

**Idaho's first columbium-tantalum mine, and the first in the nation,** will be brought into production by Baker Brothers of Boise under a contract now being negotiated with General Services Administration. It is expected to be a 5-yr, floor-price purchase agreement covering more than 1-million lb of combined pentoxide.

The mine is expected to provide 40% of domestic requirements for the metals. The U. S. now produces only about 1% of its needs, entirely as a by-product of bauxite, pegmatite and other minerals.

**Echo Bay Lead-Silver Mines Inc. reports that it expects to resume development work soon** at the company's 13-claim property in Kootenai County at the south end of Pend Oreille Lake.

## LOUISIANA

**Kaiser Aluminum & Chemical's Baton Rouge plant is nearing completion of its $27-million, 3-yr expansion program.** When completed, the program will mean an alumina production capacity of more than 800,000 tons a year for all of Kaiser's facilities.

The increased alumina capacity is to enable Kaiser to meet its needs in connection with its primary aluminum capacity of more than 400,000 tons a year.

Included at the Baton Rouge development are facilities for treatment of bauxite from Kaiser's newly-developed sources in Jamaica.

The Baton Rouge project is part of a $230-million privately-financed integration and expansion program. The alumina is to be used at Kaiser's Chalmette, La., plant and at the firm's Tacoma and Mead plants in Washington.

## MICHIGAN

**Most Gogebic Range mines are now operating on a four days per week schedule.** It is hoped that iron ore consumption at the steel plants will be stepped up sufficiently during the winter to justify an increase to at least five days per week.

**White Pine Copper Co's mill at its huge low-grade copper ore project** in Ontonagon County in the northwest section of Michigan's upper peninsula, began operation Oct. 5.

On that date ball mill No. 6 began operation although the ore will remain in stock-pile until later in the winter when the smelter is ready.

# cost-cutting Collector...

**Dow Xanthate Z-11 gives you more collector for your money, more profit from higher recovery and concentrate grade**

Mills all over the world have proved the economy of Dow Xanthate Z®-11 in actual operation. Make a test with Z-11 in your own mill to prove its value to you.

Z-11, Sodium Isopropyl Xanthate, works well with most all sulfide minerals occurring in base metal ores. Largest and most successful use of Z-11, however, is in differential flotation of copper, lead-zinc, or pyritic gold ores.

In addition to its excellent collecting power, Z-11 also offers the advantage of being substantially nonfrothing—permits your operator to regulate frother and collector independently for better control.

Dow also produces Dowfroth® 250, a quality frothing agent giving improved metallurgy with lower frother consumption.

For laboratory samples and complete information about Dow flotation reagents, write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. OC-838H-1.

*you can depend on DOW CHEMICALS* DOW

## Michigan *(Continued)*

**North Range Mining Co. has taken over from Republic Steel Corp.** its Penokee Mine operation at Ironwood on the Gogebic Range. Joseph Zuraw will continue as assistant superintendent at the mine and J. C. Kirkpatrick of Crystal Falls will be acting superintendent.

The Penokee is part of a group of mines (known as the Norrie group) operated by the Oliver Iron Mining Co. for many years. Some years ago the Republic took over a portion of the property on the east end of the group and renamed it the Penokee.

## MINNESOTA

**Existence in northwestern Minnesota of three major zones of abnormally high magnetic attraction** which may indicate iron bearing rock formations was reported Oct. 7 by Dr. G. M. Schwartz, director of the Minnesota Geological Survey and professor of geology at the University of Minnesota.

Zone 1 consists of two parallel belts running through northern Kittson and Roseau Counties and parallel to the Canadian boundary line. These two counties are in the extreme northwest corner of Minnesota and border on Canada.

Zone 2: A series of belts extending from the northeast corner of Marshall County (directly south of Kittson and Roseau Counties) south-westward through Marshall, Pennington, Red Lake and Polk Counties to the Red River of the North. The city of Crookston lies between two southern forks of the zone.

Zone 3: A curved belt through southern Polk County (which borders on North Dakota) running from Erskine west through Dugdale, then south to Beltrami. New maps outlining these areas are on public display in the office of the Minnesota Geological Survey, Pillsbury Hall, University of Minnesota; office of the U.S. Bureau of Mines, Minneapolis, and office of the Division of Lands and Minerals, Hibbing.

The aerial survey on which the maps are based used a magnetometer ("doodlebug") operated by experts from the U.S. Geological Survey. Dr. Schwartz said that extensive ground surveys and drilling would have to be done before any determination of commercial value could be made.

**Two new units have been added to the M. A. Hanna Co.'s Carlz Mine plant:** a single unit heavy media plant to treat oversize material from the washing plant and a jig plant consisting of 12 four-cell jigs to treat the classifier product. This is the third season of operation for the Carlz plant.

**R. T. Elstad, president of the Oliver Iron Mining Division,** has announced that after Jan. 1, Oliver again will go on a 40-hr week instead of the present four-day week.

He said that, in spite of curtailed production in 1954, ore output for the year was greater than that of 32 yr out of Oliver's 53 yr of operation.

Elstad predicted that the 1955 season will require more Lake Superior ore than did 1954. He added that the company has a good backlog of work for the winter and expected that many laid-off employes would be re-hired at the 1955 opening of shipping.

## MONTANA

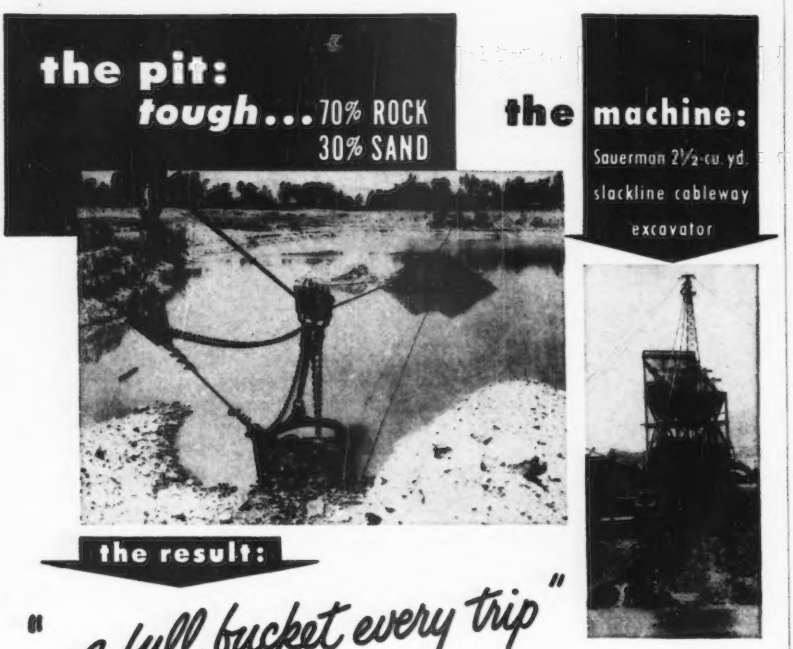
**Operations of Anaconda Aluminum Co.'s plant at Columbia Falls, Flathead County,** are slated to begin before mid-July, according to R. B. Caples, company president, New York, who recently visited the plant.

By the end of 1954, it is expected that all concrete and structural steel work will have been completed. Pots are being set in place. Baking of anodes is scheduled to get underway in June with the first metal being produced early in July.

The plant will have an annual production capacity of 60,000 tons. Alumina will be obtained through Reynolds Metals Co.

H. G. Satterthwaite is plant manager; James Smith, production superintendent, and Carl Lundborg, mechanical superintendent.

**Scratch All Mine, Philipsburg, has been granted a DMEA loan** to explore for


*Another actual field report*—Helena Sand & Gravel Co., of Helena, Montana, switched to this Sauerman equipment in 1946. It's been in operation since then . . . successfully performing difficult underwater excavation of rock and colloidal sand where other equipment had failed.

Sauerman Slackline Cableways span water, bogs or pits . . . reach far, dig deep, lift and carry loads to hoppers or cone piles. However tough the pit, Sauerman equipment brings in a good load every trip.

With a Sauerman Slackline Cableway, one man—in safe position—operates a single machine . . . does the complete job, quickly, efficiently, economically! Sauerman Slackline Cableways range from ⅓ to 3½ cu. yds.—span distances up to 1,000 feet . . . handle such materials as sand, gravel, clay, peat, ore and rock.

Write today for more information, including these handy field reports and catalog:

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| FR-213 | Cleaning Ponds Without Draining |
| FR-102 | Digging Gravel From a River |
| Catalog C | Sauerman Slackline Cableways |

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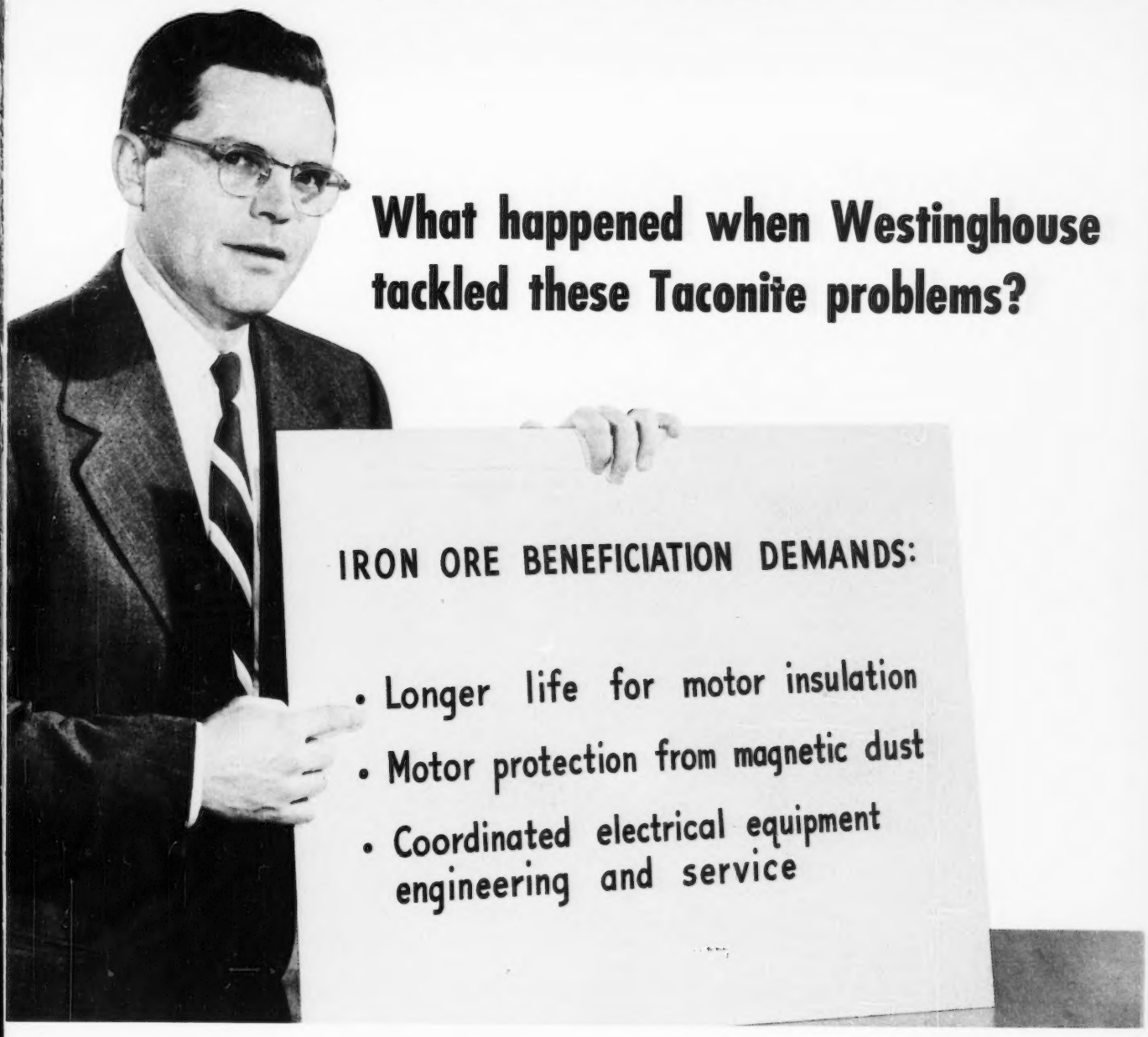
SAUERMAN BROS., Inc.

# What happened when Westinghouse tackled these Taconite problems?

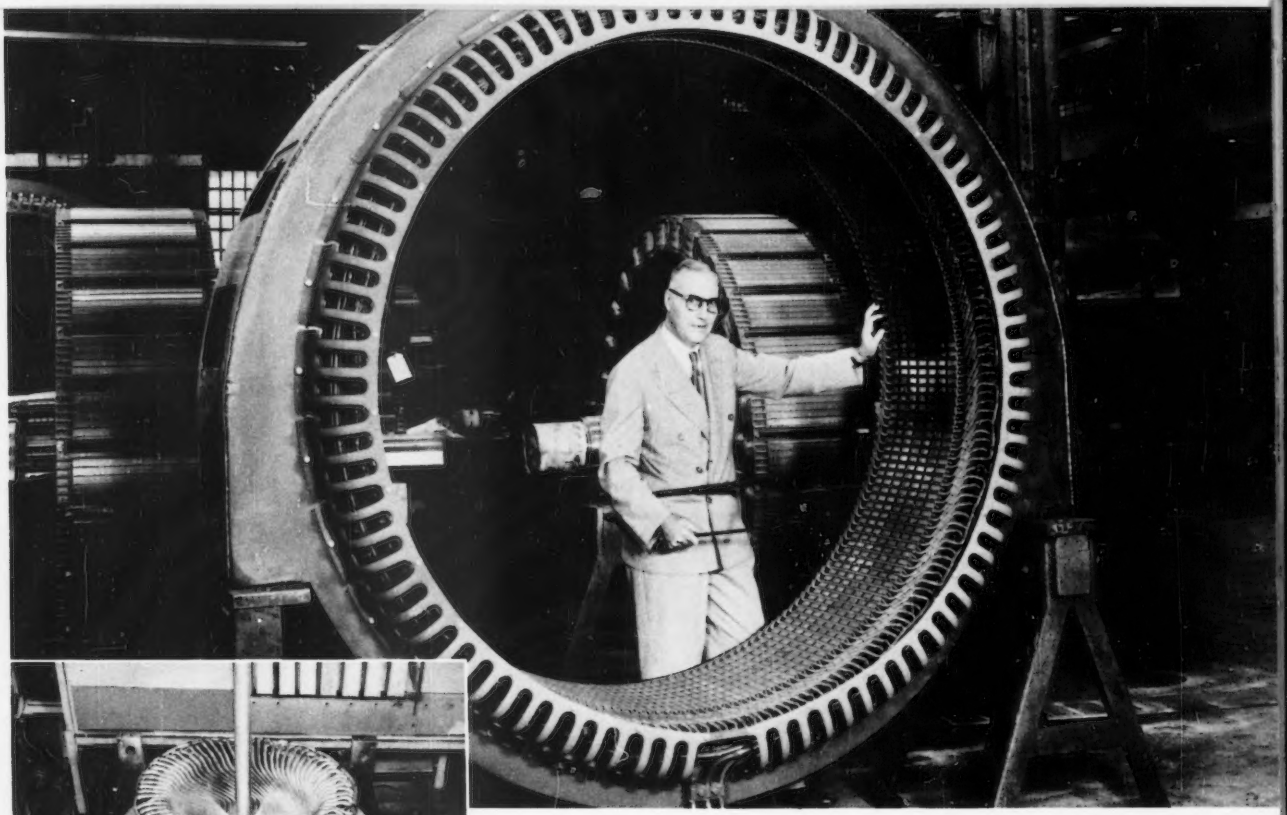

IRON ORE BENEFICIATION DEMANDS:
• Longer life for motor insulation
• Motor protection from magnetic dust
• Coordinated electrical equipment engineering and service

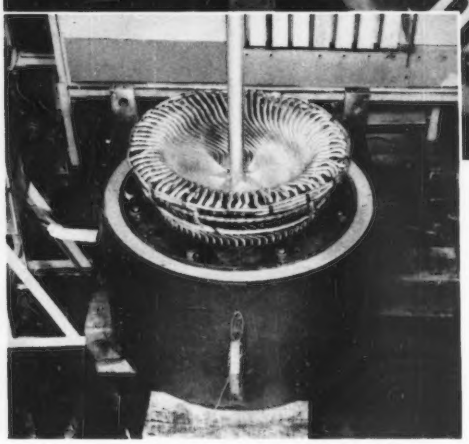
**MEET ED RECTOR,**
**WESTINGHOUSE MINING INDUSTRY ENGINEER, WHO REPORTS:**

"On the next three pages you'll meet the men in the Westinghouse organization who found answers to these tough electrical problems. Their report on several Westinghouse product developments and applications for Taconite processing may suggest a solution to your problem. No matter what type of mining you're engaged in, their specialized abilities are part and parcel of the complete manufacturing, engineering and service facilities available through your local Westinghouse representative."

**NEXT PAGE, A NEW LOOK AT PROTECTION FOR MOTOR DRIVES . . .** →

YOU CAN BE **SURE**...IF IT'S
Westinghouse





*Manager, Large A-C Motor Section

**Describing a new lease on insulation life, M. R. Lory* shows**

# How Thermalastic® stops ball mill motor failure

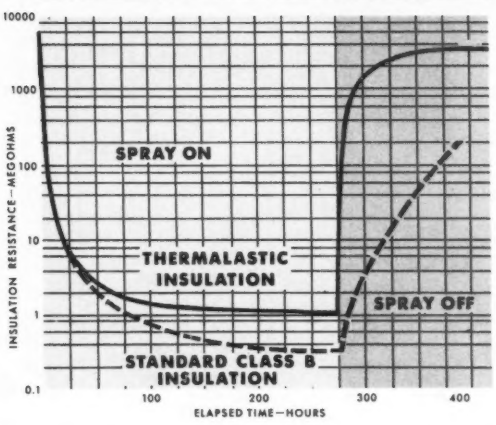
New Thermalastic insulation prevents costly motor failure by eliminating insulation "voids" which fall prey to moisture, dust and dirt.

**Westinghouse engineers studied** the rough and tumble life of insulation on large motor coils. They found why the severe combination of moisture and dust often is too much for conventional insulations. Under close examination tiny, natural voids or weak points proved to be the main cause of failure in conventional insulations.

**To meet the problem,** Westinghouse developed Thermalastic insulation with improved resistance to moisture and dust . . . with a 20% increase in dielectric strength . . . a ten-to-one increase in voltage endurance, and better heat transfer to prevent hot spots developing.

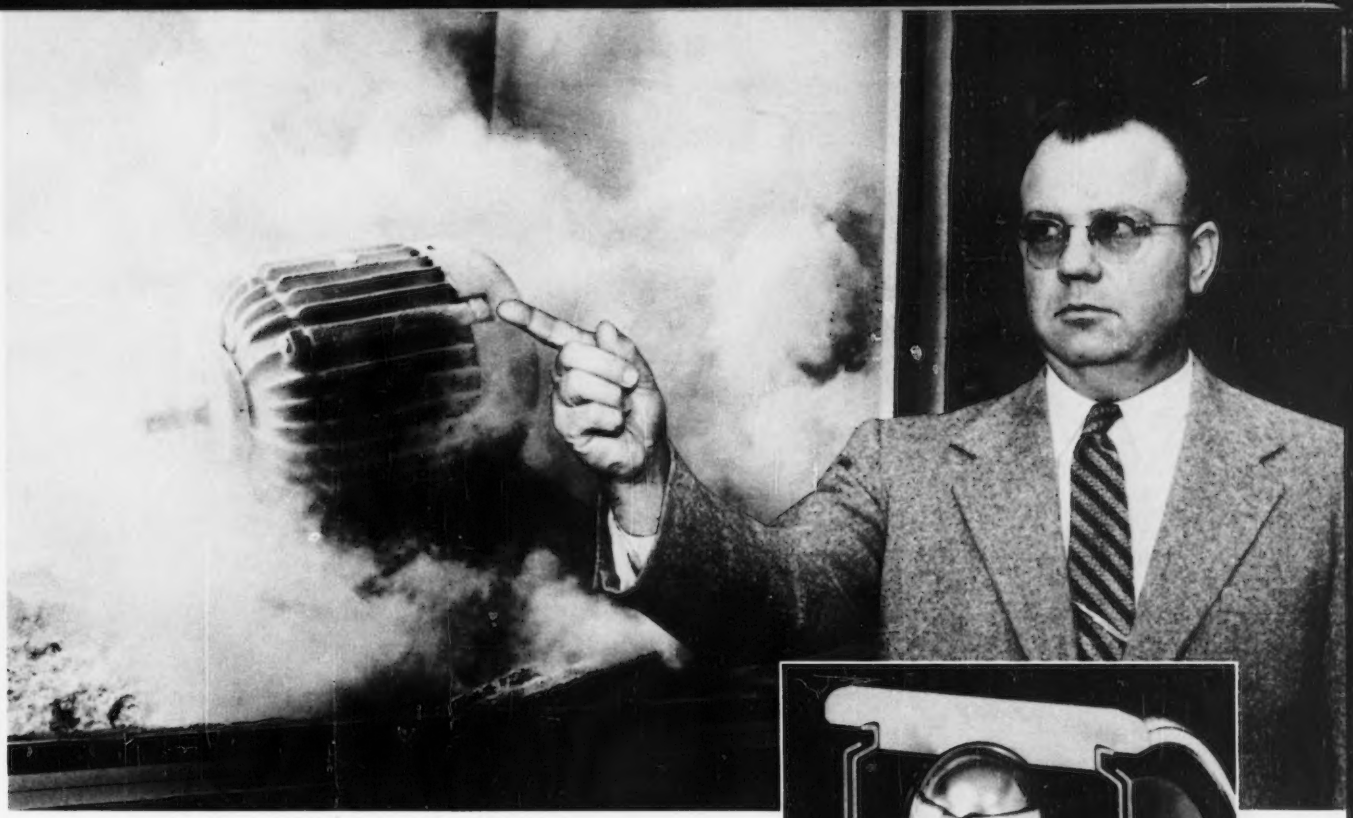
**Thermalastic presents no weakness,** it has proved impervious to the most severe conditions in Taconite plants. Winding failures have not been reported on a Thermalastic-insulated motor since the first application in 1952.

**Talk with your Westinghouse representative** now about the use of Thermalastic for new, large motors and motor rewinds.




**Water spray test** was conducted on the stator winding of the 950-hp, 4160-volt motor shown above, and a similar motor with ordinary Class B insulation. The test lasted 275 hours and 200,000 gallons of water passed over windings of both motors. Graph, above, shows the rapid recovery rate of Thermalastic-insulated coils proving that water never penetrated this insulation.

YOU CAN BE **SURE**...IF IT'S



*Manager, A-C Motor Section

**Here's Steve Keller* to report . . .**

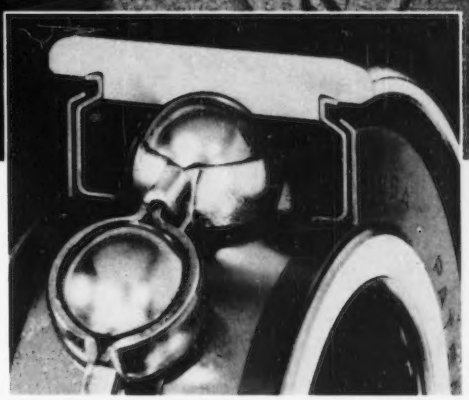
# New Life-Line® "A" motors defy Taconite conditions

Here's how this *standard* totally-enclosed, fan-cooled motor is designed to meet the rugged operating conditions you face in Taconite processing.

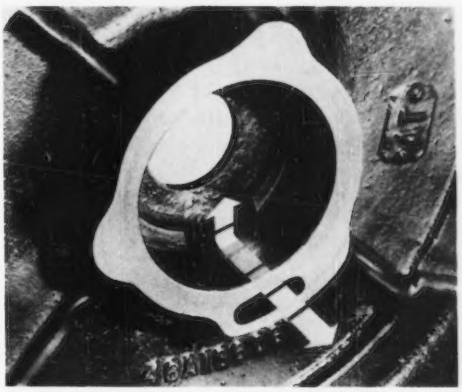
**Four-way sealed, pre-lubricated bearing.** Taconite processors report that 95% of all motor failures are caused by bearing failure. Results of accelerated bearing life tests in a sealed dust chamber showed new Life-Line "A" bearings in good condition after being in operation for thousands of hours. This amazing endurance results from an exclusive design. *Two seals* on each side of the bearing form a flinger and labyrinth which positively prevents entry of abrasive Taconite dust.

**Complete protection.** Life-Line "A" motors are fully enclosed and completely protected against dust, dirt, moisture and corrosion. Rugged, cast-iron housing stands up under constant abuse. Neoprene flinger effectively guards shaft opening against entrance of magnetic particles. Nonmagnetic fan of molded glass plastic maintains full cooling efficiency.

**Let us show you** the many other features that make the standard Life-Line "A" motor ideally suited to all types of rugged service.

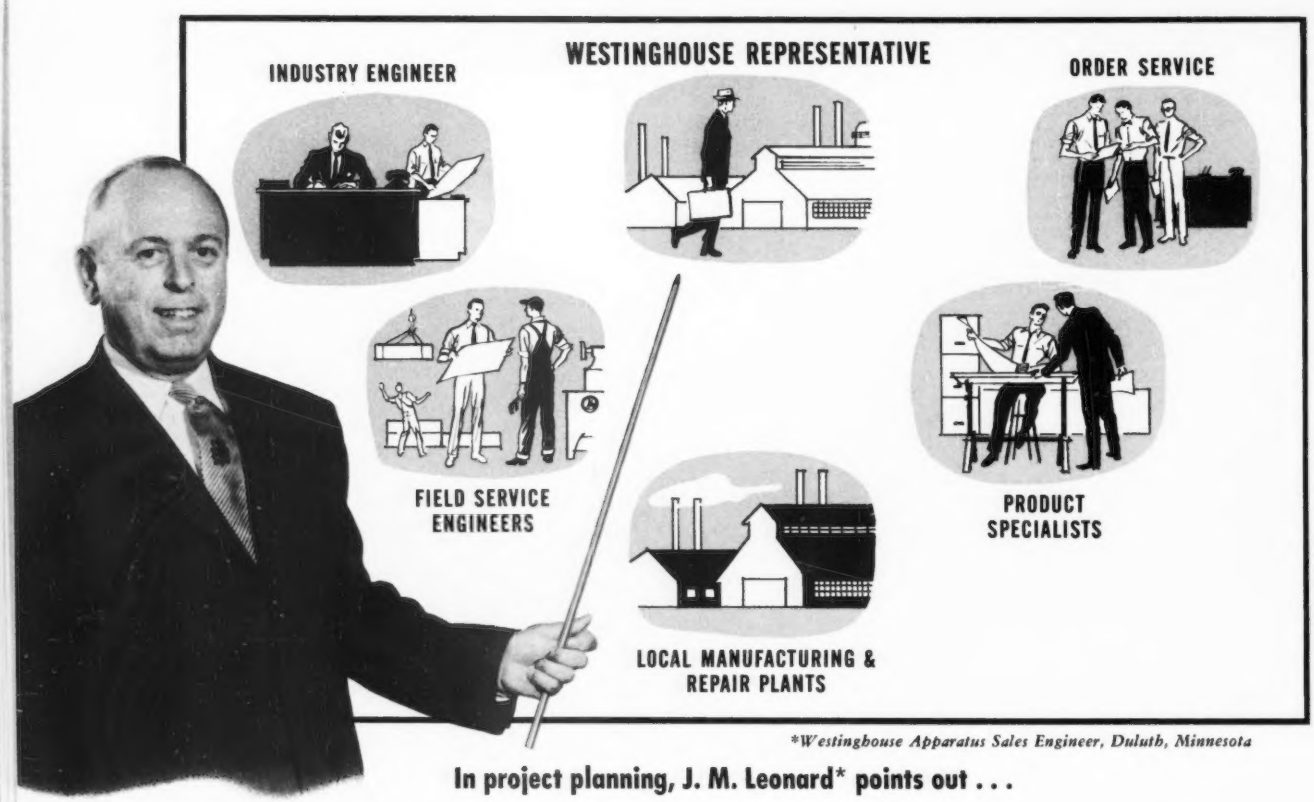


**Four-way sealed, Life-Line "A" bearing.** The inner seal is attached to the outer bearing race and is stationary. The outer seal is attached to the inner race and rotates with a flinger action. Note these are true seals not shields.



**Exclusive air bypass** allows motor to "breathe"—*but not through the bearings.* Contaminated air is diverted around shaft and bearings, eliminating a potential source of bearing failure.

Westinghouse




*Westinghouse Apparatus Sales Engineer, Duluth, Minnesota

**In project planning, J. M. Leonard* points out . . .**

# All Westinghouse facilities answer your call here

For example, when one Taconite processor called in Westinghouse, we were able . . .

**To provide undivided responsibility** in working with consulting engineers, contractors and company engineers both at headquarters and at the site. Westinghouse industry engineers worked closely with design engineers and product specialists to assure coordinated equipment selection.

**To simplify ordering and follow-up,** several purchase orders were combined into one. Westinghouse Order Service followed through manufacturing progress arranging shipping schedules and delivery to tie in with project development.

**To speed installation** Westinghouse field service engineers supervised erection, installation and start-up.

**And to maintain service** when needed, the local Westinghouse Manufacturing and Repair Plant, one of 38 across the country, handles all types of inspection and repair jobs on a 24-hour basis. Equipment that cannot be moved is serviced on location.

**For your planning** learn about the facilities Westinghouse offers to service your electrical needs in all phases of mining and ore processing.

Call the local Westinghouse representative. For special *Taconite help* call Westinghouse in Chicago WH 4-3860, in Duluth 7-1541 . . . or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

**New Westinghouse Repair Plant** at Duluth provides convenient facilities geared to service the large-scale equipment required in ore processing plants. MP-3034

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| Life-Line "A" Motors | B-6154-A |
| Life-Line Motors (200-700 hp) | B-4731 |
| Large Induction Motors | B-4739 |
| Synchronous Motors and Controls | B-5300 |
| Power Centers | B-4162 |
| Preventive Maintenance Book | B-5477-A |
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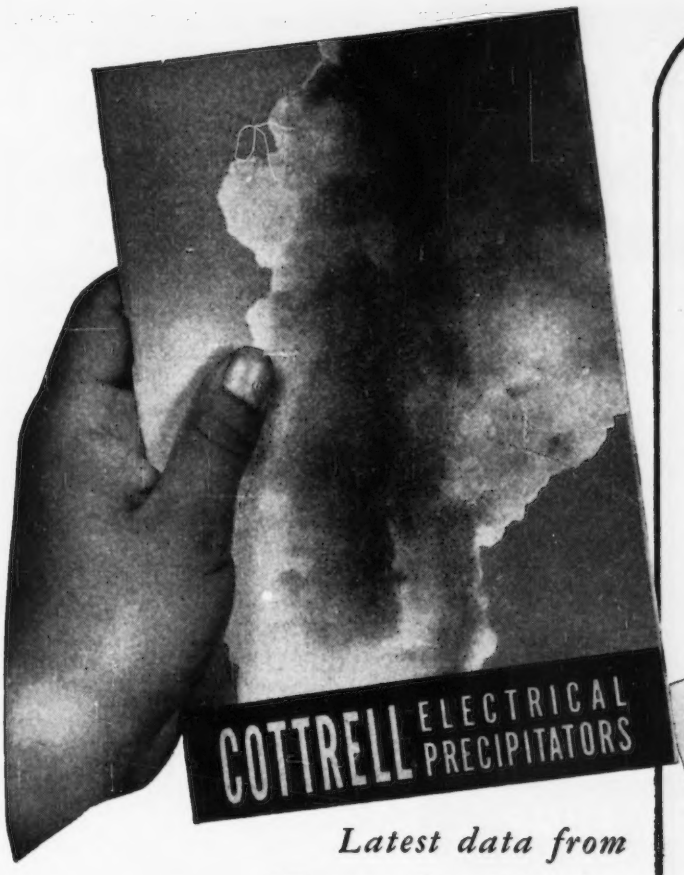
YOU CAN BE SURE...IF IT'S Westinghouse




# 40 PAGES of helpful information

## on Recovering Dusts, Fly Ash, Mists, Fumes and other Suspensions from Gases.

*This booklet summarizes*

the important points design and plant engineers should know about Cottrell Precipitators . . .

- Basic types of Cottrell equipment.
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- The effect of various factors on efficiency and performance.
- Data on CMP (Combination Multiclone-Precipitator) Units.

. . . and many other helpful facts on Cottrell design and operation.

## *Latest data from Western Precipitation on Cottrell Recovery Equipment*

Do you have operations in your plant where gas-laden suspensions, wet or dry, are a problem? Such suspensions may be dropping on surrounding property, causing nuisance difficulties. Or perhaps important values are being lost in stack gases that can be profitably recovered. Whatever the nature of your recovery requirements, you will find this 40-page Cottrell booklet of great help. It contains up-to-date data on the latest advancements in the electrical precipitation field – prepared by the organization that pioneered the commercial application of Cottrell Electrical Precipitators almost a half century ago and has consistently led in new Cottrell developments.

**A copy of this data-packed booklet will be sent free to engineers and other executives interested in recovery processes. Send your request to our nearest office.**

*For nearly 50 years Western Precipitation has carried on a continuous research and development program on Cottrell Electrical Precipitators, Multiclone Mechanical Collectors and other types of recovery equipment. We are not affiliated with any other company in the electrical precipitation field except our wholly owned subsidiaries, International Precipitation Corporation and the Precipitation Company of Canada, Ltd. We are equipped to serve you anywhere in the United States, Canada, and throughout the world!*

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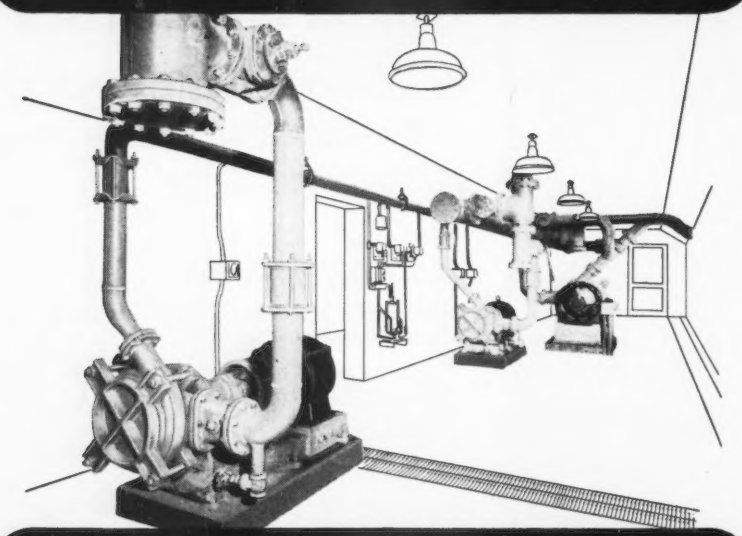
# Handles extremely thick slurries with high specific gravities



## MORRIS Type R SLURRY PUMP

Heavy viscous slurries with solids ratios as high as 70% by volume are not unusual loads for a Morris Type R Slurry Pump.

A case in point is this Morris installation at the Missouri Portland Cement Co., St. Louis, Mo. The two Morris 3R Pumps in the foreground each handle 200 GPM of a cement slurry at 64% solids with 1.66 specific gravity. Speed is 1180 RPM. The 6R Pump in the background handles 600 GPM of the same slurry at 880 RPM.

**Long operating life...**
**little or no maintenance**

Massive running parts of the Type R compensate for the increased load imposed by high specific gravities. Hydraulic passages are deliberately designed for high concentrations of solids—the result of careful study of wear patterns shown by pumps in the field handling all kinds of abrasive materials. Elimination of areas of throttling and turbulence assures uniform wear of all parts.

There are no internal studs or bolts—no troublesome internal joints and fits. The suction disc liner is merely *clamped* into position between disc and shell. The absence of high stress on the shell permits wide variations in its composition—including materials of high abrasive resistance—to resist wear and extend the operating life of the pump.

Let our engineers consult with you on your slurry pump problems. They'll give you the benefit of 88 years of pump-building experience. Or, write for Bulletin 181.

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## Montana *(Continued)*

manganese, lead and zinc. DMEA's share of the project is $80,200 of a total amount of $128,320. The mine is being operated by Peter Antonioli, Butte.

**Wilbur Carmin, of Pony, was elected president of the Madison County Mining Association,** at the association's annual meeting in Twin Bridges recently. Carmin succeeded Claude O. Dale.

J. Gilbert Evans, Virginia City, was elected vice president and R. B. Vickers, also of Virginia City, was re-elected secretary-treasurer.

Dr. J. R. Van Pelt, Butte, president, Montana School of Mines and director of the Montana Bureau of Mines & Geology, described work that his organizations are doing and expect to do to stimulate Montana mining activity.

Millard Reyner, Butte, who had just returned from a professional assignment with the Atomic Energy Commission in Australia, gave an illustrated talk on his trip. Reyner recently was transferred to the AEC office in Phoenix.

## NEVADA

**The Josefa claims, adjacent to the Cordero Mine in Humboldt County, have been leased** by Jay A. Carpenter, former director of the Mackay School of Mines, who has in turn leased them to the U. S. Mercury Corp.

The Josefa group consists of five claims lying to the east of the Cordero, which is one of the largest mercury producers in the U. S.

**F. A. Vollmar,** Silver Peak mining operator, is the first shipper of uranium in Nevada. He is currently developing the Rundberg uranium property at Austin under the name of Uranium Mines Inc. He has 10 men engaged in driving a tunnel along the vein where the radioactive material is composed chiefly of autenite with torbernite also present.

**The Mohawk Mine and Mill near Silver Peak in Nye County will be placed in operation** in the very near future. The announcement was made by Avery Brundage, president of the International Olympic Games and president of Bruhi Enterprises, which leases the Mohawk properties.

W. Church Holmes will be general manager of the mine and mill, and Frederick Ruegseger will be office manager.

**Combined Metals Reduction Co. has added 25 men to underground mining operations at its Pioche District,** lead-zinc properties, according to firm announcement. About 135 men are now employed at the mine and mill.

**Minerals Engineering Co., of Grand Junction, Colo., has leased the Baltimore-Camas tungsten mill at Ely,** which is the property of the Baltimore-Camas Co. of Idaho. The leasing firm will place Earl Craig in charge of the plant. Craig has been running a mill in Montana.

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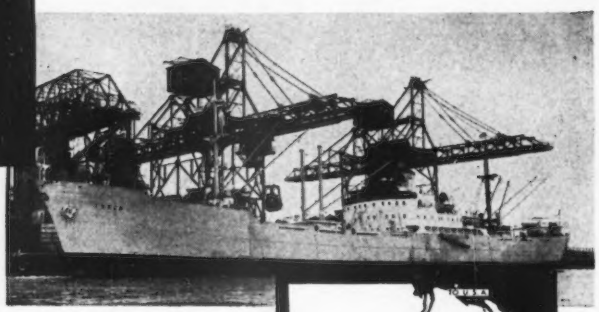
*happy ending of a seven year voyage*

**First ore from Cerro Bolivar arrives at U. S. Steel's Fairless Works**



Unloading the first ore from Cerro Bolivar from the S. S. Tosca at U. S. Steel's Fairless Works, Fairless Hills, Pennsylvania.

From Cerro Bolivar 90 miles to Puerto Ordaz, at the junction of the Orinoco and Caroní Rivers, this first ore shipment moved over tracks—under which lies a Fairchild topographic map.

From Puerto Ordaz 177 miles down the lazy Orinoco, through the Cano Macareo, to the Gulf of Paria, the route of the S. S. Tosca lay through a dredged channel—the charts of the river, the dredging, and the navigational aids based on a Fairchild controlled Photomosaic map.

So the vital basic decisions have been proved sound—the long voyage is over, and the first steel has been poured.

When you make the vital decisions which may affect your company's future for generations, let Fairchild provide you with the facts!

**THE VOYAGE** really began in April, 1947, when one of Fairchild's A-26 photographic aircraft, flying for the Orinoco Mining Company, four miles above the Venezuelan plains, exposed the film on which appeared the image of Cerro Bolivar—truly aerial photography's finest hour.

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## Nevada *(Continued)*

**Sonomo Quicksilver Mines Inc. has started operations on the Turrillas property** 10 mi east of Paradise in Humboldt County. A well has been drilled and a cook house, dining room, bunk house and change room have been constructed. Installation is under way on a 100-ton Gould rotary furnace, and a power line has been run to the property.

**Hadsel Products Co. reports that test runs have been completed on the ore mill** which has been under construction in the Wells area. The mill will be used to treat ore from the old Polar Star mine near Wells, and a steel structure is being erected to enclose the machinery during the winter months.

**Office of Defense Mobilization has instructed General Services Administration** to arrange a research and development contract with Bureau of Mines facilities at Boulder City, Nev., and Albany, Ore., with an aim toward refinement of titanium production techniques.

The proposed contract will require reactivation of the Boulder City facility which was closed last September. This facility in the past has made valuable contributions to early development of titanium production techniques.

## NEW MEXICO

**Mineral production in the state exclusive of oil and gas was valued at $97,728,018** during the fiscal year ending June 30, 1954, a $6,316,572 drop from the previous year, it was reported by State Inspector of Mines John A. Garcia.

**Negotiations are under way for a joint $16-million potash mine** and refinery in New Mexico between Freeport Sulphur Co. and Pittsburgh Consolidation Coal Co. of Pittsburgh. The proposed plant would be built mid-way between Carlsbad and Hobbs and would produce 240,000 tons of commercial potash a year and would take two years to build. A spokesman for Freeport Sulphur reported that negotiations between Freeport and Pittsburgh Consolidation Coal are still in progress and plans are not final. Freeport has had a crew under Ray Jenkins, project superintendent, proving leases in the area for three years.

**Operation of the new uranium ore processing plant** at Shiprock began Nov. 1.

The plant, ninth on the Colorado Plateau, was built by Kerr-McGee Oil Industries Inc., under AEC contract. It is operated on a custom basis, buying both uranium and vanadium ores.

Kerr-McGee also took over operation of the ore-buying station at Shiprock, which had been operated by American Smelting & Refining Co. since 1952.

The acid leach method is employed at the processing plant.

Other uranium mills on the Colorado Plateau are at Grants, N. M.; Uravan, Rifle, Durango, Naturita and Grand Junction, Colo., and Salt Lake City and Monticello, Utah.

## New Mexico *(Continued)*

**Atriminas Uranium Production Co. at Silver City began shipping stockpiled ore** to refineries in October. Ore was shipped to plants at Salt Lake City, Anaconda, N. M., and Grants.

**Kerr-McGee Oil Industries Inc., and the National Farmers Union plan to develop 13,000 acres of rich potash land in** southeastern New Mexico, near Artesia. Potash land controlled by the farm union has an estimated value of $120-million.

Five potash companies, with a payroll of approximately 4,000, already operate in the Carlsbad potash basin area.

**Rare earth discovery, reported running $2534.45 per ton** in dysprosium, erbium, gadolinium and lutecium has been uncovered on a property of New Mexico Copper Corp., C. H. Degner, president, reported.

## NORTH CAROLINA

**Waxhaw Minerals Corp., a new firm, is reactivating the concentrating mill at the former Condor Gold Mine,** also known as the Howie Mine, north of Waxhaw, in preparation for processing gold ore to be shipped in from nearby Montgomery County.

**Foote Mineral Co., Philadelphia, reports that its spodumene mine and concentrating facilities** at Kings Mountain have been expanded. Capacity of Foote's lithium plant at Sunbright, Va., also is being increased. In addition, limestone production has been expanded by Foote to balance the flow of spodumene.

## OREGON

**Cordero Mining Co. is reported installing a small furnace at its Horse Heaven Mine** in Jefferson County to treat cinnabar ore already broken but left in the mine when the property was shut down by fire in December 1944.

The property was one of the most active and best known Oregon quicksilver producers before and during World War II. Initial claims were filed in 1933 and Horse Heaven Mines Inc., acquired the property in 1936.

**Pacific Northwest Alloys Inc., expects its $150,000 chrome concentrator** at Coquille to be completed in January, according to M. E. Hertel, manager of the company's operations at Mead, Wash.

Concentrator will have 150-ton daily capacity and will upgrade 55,000 tons of stockpiled chrome concentrates. These concentrates, running about 40% chromium oxide, will be shipped to Mead for conversion to low-carbon ferrochrome in two electric furnaces.

The conversion contract is between Pacific and GSA. About 10,000 tons of high grade chrome concentrates will go to Mead from Coquille and an equal amount from a Government stockpile at Nye, Mont.

## TEXAS

**Plans have been completed for construction by American Potash & Chemical Corp. of a plant** near San Antonio for the manufacture of lithium chemicals, Peter Colefax, president, announced recently.

The new plant will be owned by a new company, American Lithium Chemicals, Inc., 50.1% of whose stock is held by American Potash & Chemical Corp. Remainder of the stock is owned by Bikita Minerals (Private) Ltd.

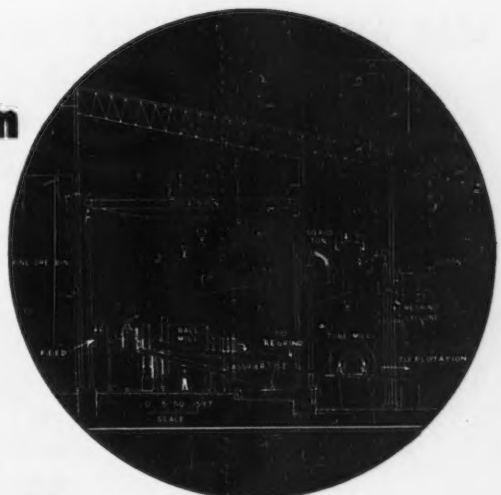
Lithium ores will be supplied by Bikita from large deposits in Southern Rhodesia.

American Potash & Chemical Corp. already holds a 21.25% interest in Bikita Minerals. Selection Trust Ltd. of London is responsible for technical management of Bikita Minerals in which they and associates hold a 50% interest. Another principal stockholder is American Metal Co. Ltd.

**First mining activity in years has been reported** from the Terlingua area of the Big Bend country.

The Mariposa quicksilver mine is scheduled to be reopened and several


lower concentration costs... with



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Grinding costs, the most expensive item in the concentration process, can be cut when you use CF&I Grinding Balls. Forged of tough, special analysis steel, CF&I Grinding Balls have the ideal balance between toughness and hardness that means efficient, economical operation. You will get greater through-put, whether in coarse grinding or in the finer mesh sizes. CF&I Grinding Balls are available in diameters from ¾ inch to 5 inches.

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## Texas *(Continued)*

other quicksilver mines in the area may follow suit, one source said.

Announcement of the reopening of the Mariposa mine has been made by the Rainbow Mining Co.

## UTAH

**United Park City Mines Co. production is hitting 250 tons daily of lead-silver-zinc ore** and greater output looms with stabilized metals quotations, says F. A. Wardlaw, Jr., Salt Lake City, vice pres.

Only 160 miners are at work in the Ontario Section of the property. But "more employment looms in the immediate future," Wardlaw adds.

Development work on several levels of the Ontario mine started in mid-October and is now being extended into the properties of the old Silver King Consolidated Mines Co.

**Peterson Filters & Engineering Co., Salt Lake City, announced they have been awarded** a prime filter contract worth about $250,000 by Climax Uranium Co., Grand Junction, Colo.


READ WHAT THIS DRILLER THINKS OF

May 6, 1954

Spang & Co.
P. O. Box 571
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Attention: Sales Manager

Gentlemen:

Last summer we purchased a set of your 8" Molloy Bits.

We have used these bits on a number of wells in the San Andres lime which is a very hard formation and a good formation to test the quality of steel in bits. Our experience with the Molloy Bits has been quite satisfactory and so far we have not jumped a pin off of these bits. With other bits we ordinarily jump one or more pins on each well we drill.

These bits stand up for a longer period of time and consequently do not have to be dressed as often. They have presented no problems in dressing or tempering. We use natural gas or butane in our forges.

We are well pleased with the bits and it is our plan to replace our other bits as they wear out with the Molloy Bits.

Yours very truly,
*Name on request*

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**Newmont Mining Co. has two field parties at work on the Colorado Plateau** investigating uranium properties and prospects, according to H. DeWitt Smith, director of the firm and retired vice president.

**Western Phosphates Inc., will double capacity of its phosphoric acid department at Garfield,** where the firm produces superphosphates and ammonium phosphates.

**Homestake Mining Co. plans production of ore from its La Sal Mining & Development Co.** lease, Moab district, in December.

A three compartment shaft at a depth of about 575 ft already is in ore on the property.

**Climax Molybdenum Co. has given $50,000** to help build a new $350,000 hospital at Leadville.

**Harry Scheifele, retired businessman of Sandusky, Ohio,** who started prospecting last March "just out of curiosity," shipped 5,000 lb of uranium ore in one week to the Grand Junction mill.

Scheifele now owns the Lucky Jack Mine in Grand County, and is operating it himself with six workmen. He has no company, is selling no stock.

**Homestake Mining Co. announced discovery of high-grade uranium** on its Little Beaver Mining Co. lease southeast of Moab.

The Little Beaver tunnel, being driven by the Centennial Development Co. of Eureka, is the deepest and largest sunk to date in the uranium region.

**Acme Uranium Mines Inc., headed by L. B. Wright of Grand Junction, Colo., announced plans for an exploratory drilling program** to develop additional reserves on its claims in the Circle Cliffs area of Garfield County.

The four claims, recently purchased from the Maley Mining Co. of Dove Creek, Colo., are yielding about 1,000 tons a month.

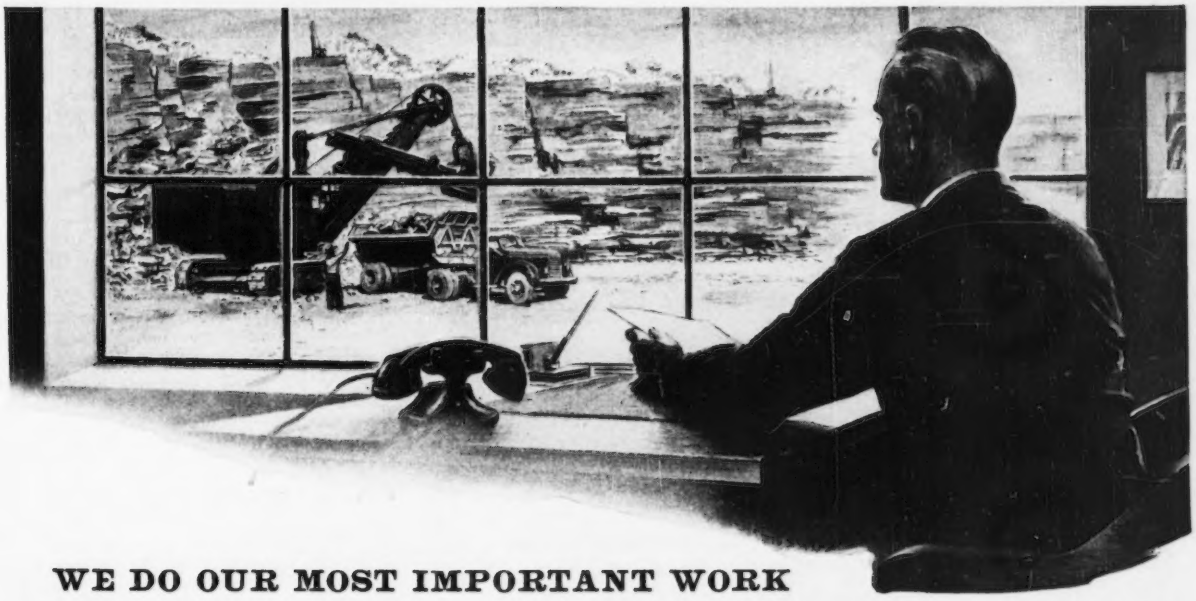
**A drilling program on two Lucky D Uranium Mining Co. claims 50 mi north of Monticello** has blocked out a minimum of 70,000 tons of ore assaying from .20% to 1.20% uranium, the company announced.

Wade A. Dillon of Cortez, Colo., Lucky D president, said overburden will run from one to 15 ft, so that mining costs will average less than $5 per ton.

**Cherokee-Utah Uranium Corp. reported that it has outlined an orebody** estimated at 19,400 tons on its Beaver Mesa property.

A contract is being worked out with the American Uranium Co. of Grand Junction, Colo., to mine the ore, said D. C. Anderson, president. A 420-ft shaft is planned.

**Ore now is being shipped from the Jolly Jack Uranium Co.** claims in Butler Wash, San Juan County. A. D. Morgan, an officer of the firm, said geological reports indicate an orebody valued at about $400,000. Shipments are expected to be increased soon to 40 tpd.



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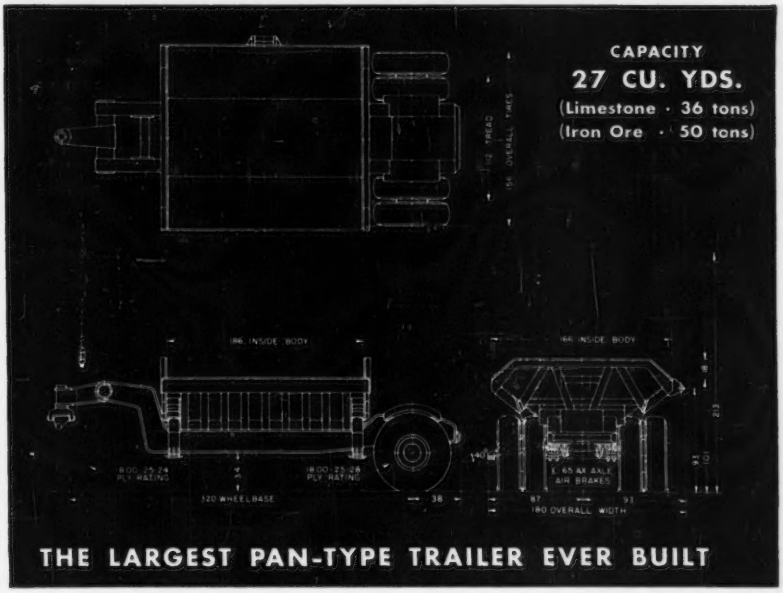
Through the long cycle of change the spur for every forward step has come from men who dared to think ahead. From everywhere they sought us out to work with them toward new and better means of transportation. The constant spearhead has been the now famous EASTON pan-type side-dump trailer.

No two installations of EASTON equipment have been alike. Progress in design, construction, capacity, speed, and method of application runs at the swift day-to-day pace set by the men for whom we work. For EASTON it has been necessary to maintain complete flexibility and adaptability in manufacturing in order to meet new, unprecedented demands with immediate action.

Experience has taught us that side-dumping trailers, truck bodies, and tandems cannot be regarded as standard equipment to be delivered from available stock. While some practical and economical standards have been developed, such as the sturdy E-series axles, we have come to accept side-dumping as an idea . . . a proven, workable idea in which our background of experience provides tangible footing for the next step ahead.

• • •

NOW WE SEE, with the men who dare to look ahead, the unfolding of a splendid new panorama of industrial opportunity. We offer, from the measure of our experience, a patient, cooperative effort toward higher levels of performance and sound new economies with the side-dump idea.




Now in production at EASTON is the new Model TP-2736 Pan-Type Trailer, the largest side-dump ever built. The trailer rated at 36 tons capacity for limestone will handle 50 tons of iron ore with only minor variations in design. A tandem potential of 75 to 100 tons is indicated. The dumping mechanism for this great new trailer will be based on EASTON's exclusive background of experience in electric overhead dumping systems for mine and quarry service.

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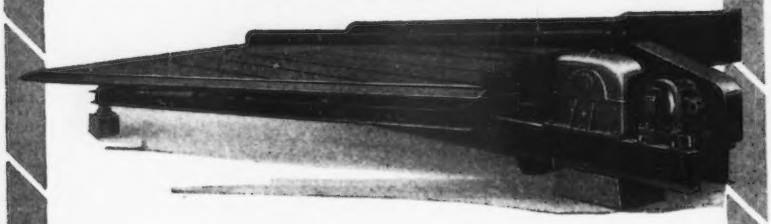

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By fanning out the pulped feed over more efficient riffling area, cutting is more accurate, concentrates are of higher grade, tailings are leaner and you have a reduced volume of middlings.

This adds up to more yield from new feed and lowered rehandling or recirculating cost, therefore less discounting of feed potential . . . and more profits.

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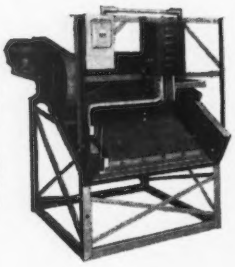

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## Utah *(Continued)*

**A contract for core drilling on the Lucky Strike and Alpha No. 10 claims** owned by the Lisbon Valley Uranium Co. has been signed with Minerals Engineering Co. of Grand Junction.

**Three core holes drilled in one week by Utah & Idaho Uranium Inc.,** on its properties near Moab all cut high grade ore, U&I President Lester S. Harrison said.

**Run-of-the-mine ore on Continental Uranium's Rattlesnake claims** reportedly is averaging 1% uranium. Continental Uranium is a subsidiary of the Helene Curtis cosmetics company of Chicago. The orebody in the Rattlesnake mine is said to be 21 ft thick.

## WASHINGTON

**Copper concentrates were to be shipped to the Tacoma smelter in October from Kromona Mines Corp.'s 100-ton flotation mill** in Snohomish County. The mill has recently been put back in operation, according to Joe F. Krom, Seattle, president. Development work underground totaling 1,000 ft has been done and new veins explored.

Tungsten concentrates are being stored. Rough tungsten concentrates run 35% tungsten trioxide and the copper runs 25% copper, 0.60 oz of gold and 4 oz silver to the ton. A new hoist for raising supplies to mine workings 2,000 ft higher has been installed. A new air trammer hauls ore out of the mine.

**Alder Gold-Copper Co. planned to start a copper exploration and development program** in November at its Twisp property, E. Royce, Portland, president, reported. Work at the mine and the company's 300-ton daily capacity concentrator were closed a year ago due to low zinc prices. The company now plans to develop a 6-month supply of copper ore before starting operations.

**A fume control system over 8 potlines at the Mead reduction plant of Kaiser Aluminum & Chemical Corp. has been completed** at a cost of more than $5-million, Walter Bast, work manager announced in October.

The project had been underway for more than 3 yr. Six of the 8 potlines had fume control systems placed last fall. Now, according to Bast, "The complete system will enable us to control and neutralize smoke and fumes given off by the pot rooms". State Senator Lloyd Andrews said that ,'forthright action" like this by other industries would eliminate the need for legislative controls now being considered by the legislature.

**The enlarged and modernized mill at the Deer Trail silver mine, near Fruitland,** was to be tested early in November by J W. Lower, manager for Alpine Uranium Corp. Capacity of the mill has been raised from 30 to 125 tons. It will have both copper and cobalt mill circuits.

The Utah company is reported to have spent more than $60,000 on the project in

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## Washington *(Continued)*

less than 3 months. The following equipment has been installed: a crusher, vibrating feeder, secondary grinder, ball mill, classifier, flotation cells, concentrate dryer, and a diesel-electric power plant. A 90-ton primary ore bin, a conveyor system and a 180-ton secondary ore bin have been completed.

Initial mill feed will come from the Turk Mine where dumps are believed to have ore which will average $18 a ton in copper and $10 a ton in cobalt. Bulldozing had exposed copper ore across a width of 35 ft. Adrian W. Cannon is president of the Utah company.

**No positive appraisal has been made of ore deposits in the Sherman Pass area** of northeastern part of state which caused a recent flurry of claims on rock formations believed to contain uranium.

Albert E. Weissenhorn, U. S. regional geologist, says the "radioactive minerals, as far as we know, are pegmatites." But he added that "no positive appraisal" has been made on the deposits.

**Six Indians from the Spokane tribe have been granted a lease on 570 acres of reservation land** they claim is Washington's first known commercial deposit of uranium.

The 10-yr mining lease was approved by the Portland area office of the Bureau of Indian affairs.

Clair Wunecoop, a member of the tribe and general manager of the newly-formed Midnight Mines, said the ore assayed "very high" in uranium content. He said twin brothers John and James LeBret discovered the ore during the summer.

He estimated 3000 tons of ore have been uncovered and 20 tons are ready to ship. The tribe, headquartered at Wellpinit, will receive a royalty of 10 to 20% on the ore.


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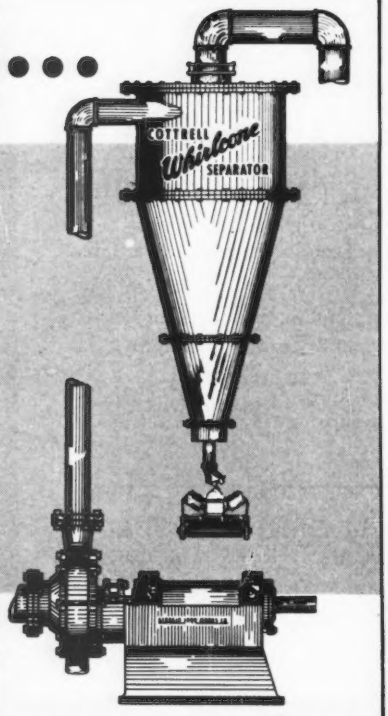


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## WYOMING

**Through installation of dragline automatic loaders, production of 100 tons daily** is planned at the open pit uranium properties of the Lucky Mc Uranium Co., 52 mi east of Riverton in Fremont County.

W. H. H. Cranmer, Salt Lake City, president of New Park Mining Co., said principal production was now from the Wind River formation and consisted of a type of uranophane. New Park is a stockholder in the Lucky Mc firm. The Utah firm is operating the properties.

**Preliminary development work is being done in the Rattlesnake Mountains of Natrona County** on what may prove to be a valuable lithium strike.

Bob Burch of Lander, who with Bob Marion and Mrs. Ruth Stephensen owns the claim, said a test carload would be shipped soon to Hill City, S. D., for processing.

Burch said an engineer who has inspected the claims reported the deposit was the most valuable he had ever seen. At least 100,000 tons are in sight, the engineer said, and mining will be relatively easy.

**Equipment for a new uranium ore-buying station to be opened by AEC at Riverton** was expected to begin arriving in November.

The station is expected to be in operation by spring. It will be operated for the AEC by the American Smelting & Refining Co., and will provide a market for Wind River Basin ores which now are being shipped to Edgemont, S. D. and other sites.

The sampler at the new station will be a semi-portable crushing and sizing plant employing automatic sampling procedures.

# IN CANADA

## ONTARIO

**Beaucage Mines has started shaft sinking on its columbium prospect** underlying Lake Nipissing 12 mi west of North Bay. The shaft, a four-compartment opening, is being sunk on Newman Is-

# CHEMICO

Significant is the fact that CHEMICO's 1,000th project is a repeat order . . . the *third* order from the same client.

This project is a contact sulfuric acid plant for a Brazilian company which placed its first order with CHEMICO eighteen years ago.

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CC-276

## Ontario *(Continued)*

land on and around which the drilling was done which indicated the company's big tonnage deposit. Initial shaft objective is 450 ft, with levels to be established at 200 and 400 ft.

**Buckles Algoma Uranium Mines, new prospect in the Blind River area,** also is planning a shaft, initial objective 500 ft. Drilling from surface has indicated 240,000 tons averaging 0.175% $U_3O_8$ to a slope depth of 210 ft, with no limits reached either to the west or down the dip.

**First ore results obtained in underground work at the property of Faraday Uranium Mines** in the Bancroft area reportingly have been pleasing. Initial drifting on the "E" zone adit returned an average of 0.114% $U_3O_8$ across 8.0 ft in its first four rounds, an average considerably above that of the drilling.

**Homer Yellowknife Mines, also in the Bancroft area, is exploring** two radioactive zones by surface trenching and diamond drilling. The main zone has been traced for a length of 5275 ft, while the second has an indicated length of at least 600 ft.

**Canada Radium Corp. plans to unwater the underground workings at its property** 15 mi southwest of Bancroft, and probably will initiate underground drilling to test the showings disclosed in previous work.

**Funds for mill construction have been arranged by Pronto Uranium Mines.** The mill, with initial capacity 1000 tons, is scheduled for completion by September 1955; expansion to 1500 tons is planned by January 1957.

**Noranda Mines has started production at its new sulphur-iron plant** at Port Robinson (see *E&MJ*, September 1954, p 142). Designed to treat pyrite ore from the No. 5 zone of the company's Horne mine at Noranda, Que., the plant will produce elemental sulphur, sulphur dioxide gas, and high-grade iron sinter by a new exclusive process.


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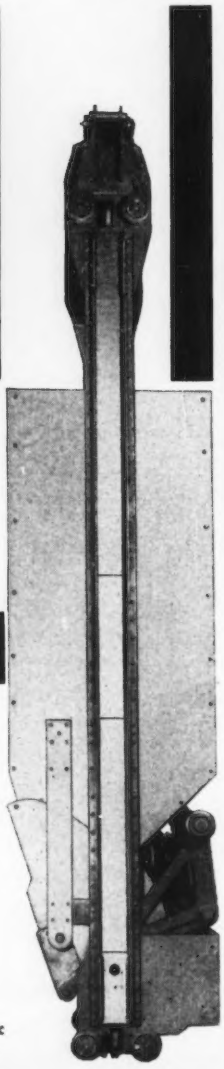

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## QUEBEC

**Iron Ore Company of Canada, which made its first shipment on July 31, 1954,** (see *E&MJ*, August 1954, p 124), will have shipped more than 1.3-million tons of iron ore by the end of the year; thus establishing itself in its short first year as second Canadian producer. (First is Dominion Wabana, Newfoundland, which is shipping 2.4-million tons this year). IOCO's 1955 objective of 5-million tons will, if achieved, give it top ranking by a wide margin.

**Considerable interest has been aroused this year in Quebec by lithium exploration and development,** all in the LaCorne about 25 mi north of Val d'Or.

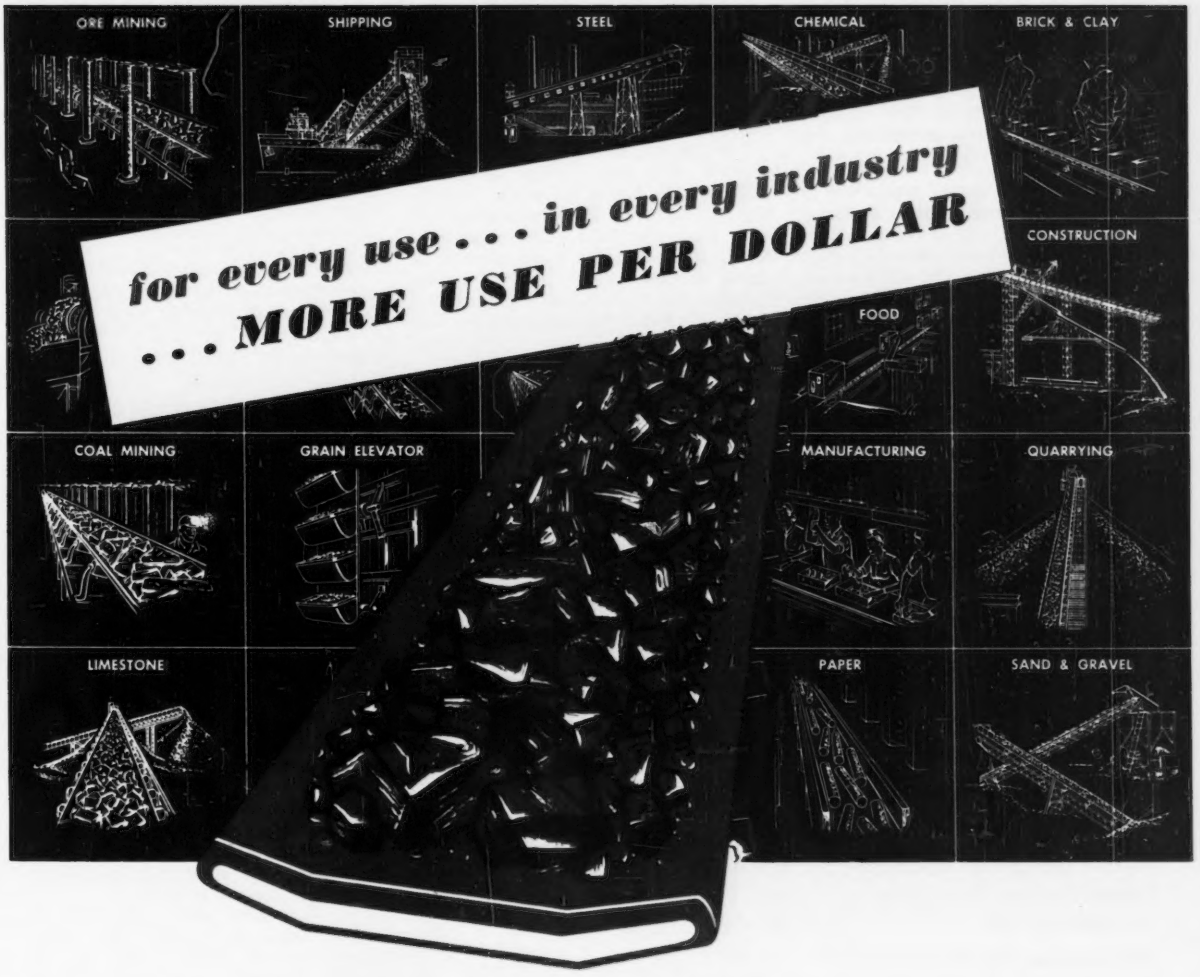
Leader in the field is Quebec Lithium Corp., which is planning a three-compartment shaft to 750 ft to develop its ore reserves which have been indicated by drilling at 10-million tons above the 500-ft horizon averaging 1.3% lithia. At the same time, mill construction has been started, the plant to have daily capacity of 1,000 tons, with a schedule that calls for start of milling by September 1955.

**Nickel-copper indications have been found by Bellechasse Mining Corp.** on its claims in the Mount Wright area north of Seven Islands on the St. Lawrence River. Values are low, but have been traced for 500 ft, with widths up to 25 ft. A crew has been sent to the property for more thorough prospecting.

## NEW BRUNSWICK

**Fundy Bay Copper Co. is drilling a lead-zinc showing near Merepis,** about 23 mi northwest of St. John. Surface work has disclosed three zones, all of which showed encouraging indications. The second hole drilled returned a core length of 29 ft averaging 0.9 oz silver, 2.33% lead, 5.0% zinc, and 0.06% copper.

**Milling operations of Burnt Hill Tungsten Mines are now established** on a basis

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## New Brunswick *(Continued)*

of 50 tons daily, and the management expects to increase this to 150 tons during the coming months. Ore reserves are estimated adequate to maintain the 150-ton rate for 2 yr.

**Keymet Mines has started production at its lead-zinc mine northwest of Bathurst,** and it is expected that capacity rate of 200 tons daily will be reached shortly.

The mill and part of the surface mining plant had been rebuilt following the fire last spring.

## MANITOBA

**Sherritt Gordon Mines Ltd. reports that additional nickel concentrates will be produced at Lynn Lake** for sale to the International Nickel Co. of Canada.

The contract calls for delivery of concentrate with total nickel content of 5,232,500 lb during he period September 1954 to April 1955, inclusive.

At the Lynn Lake mine, production of nickel concentrate is considerably in excess of planned production. A large underground crusher has been installed in the 'A' mine. The concentrator, handling ore from both the 'A' and 'EL' orebodies has handled an average of 2,000 tpd.

At Fort Saskatchewan the stockpile of concentrate now contains approximately 10-million pounds of nickel. Capacity operation of the refinery is not expected before the end of 1954. At present it is producing 20 tons of nickel daily and also recovering copper and cobalt and producing ammonium sulphate fertilizer.

**Hudson Bay Exploration & Development, a wholly-owned subsidiary of Hudson Bay Mining & Smelting Co.,** will sink a shaft on its Kluane Lake nickel copper deposit in the Yukon territory.

## BRITISH COLUMBIA

**Twin obstacles of glaciers and snowfall will be hurdled by snow tractors and aircraft** in the battle to keep supplies moving into the fabulous Granduc property of Granby Consolidated throughout the winter.

L. T. Postle, new president of Granby, which is now producing copper for U. S. government at rate of about 2-million lb a month, says that with Stewart as operating base, supplies and equipment can be successfully hauled and flown to the copper-bearing ore property, located about 28 mi northwest of Stewart in heart of a rugged, mountainous country which is blanketed in snow and ice during the winter.

But plans call for continuing stepped-up explorations next year which Mr. Postle said will exceed the $400,000 to be spent by the end of 1954.

Granby admits deterioration of its Copper Mountain property and places great hope on development of the Granduc holdings into a major copper mine with potential between 15-million and 20-million tons.

Development by exploration so far shows copper ore running to about 15,000 tons to a vertical foot, Mr. Postle reports.

**Operations are promising at the mine of Cassiar Asbestos Corp. Ltd.,** in the McDame Lake area of northern B. C., with a very strong assist from Canada's unique permafrost strata.

For in the rugged Dease River area men are carving out an asbestos mine at the chill 6,000-ft level of McDame Mountain, which lies about 45 mi. south of Yukon border.

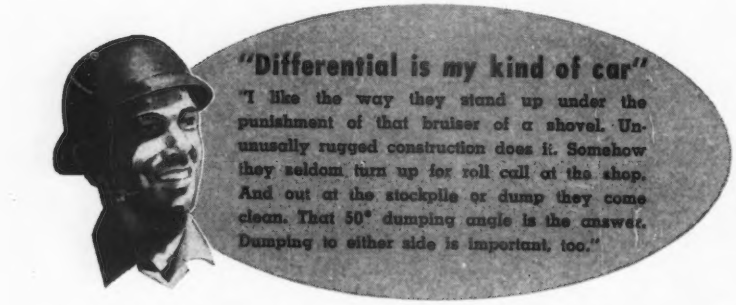
Miners have stripped thousands of tons of fire-proof fibers from the mountain's top and are now developing what may become a new mine at lower levels at what is known as the Cirque.

This summer, ore was taken from the Cirque at rate of 1,500 tons a day and before winter closes the mining operation, it is expected that more than 40,000 tons will have been removed.

This will augment the 82,000 tons mined from the main deposit before suspension for the winter.

The mined fibres are handled in the new mill (operating since July) which is treating 700 tons daily.

Cassiar asbestos deposit is exposed for 1,200 ft with asbestos bearing outcrops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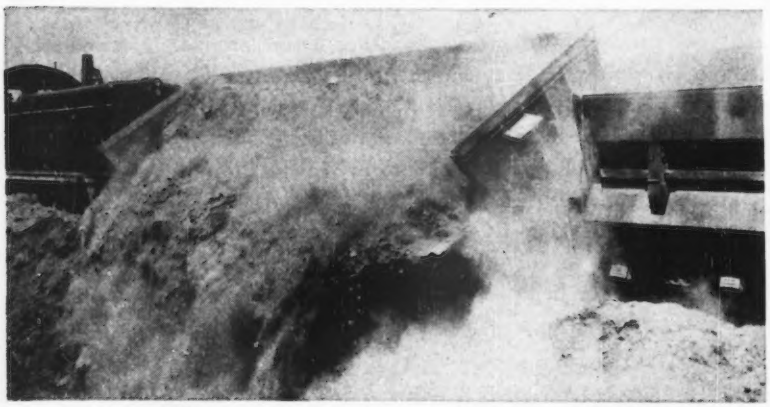

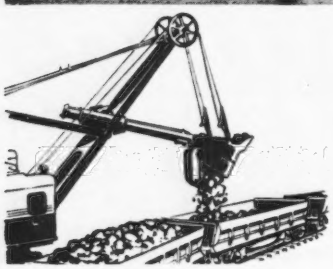

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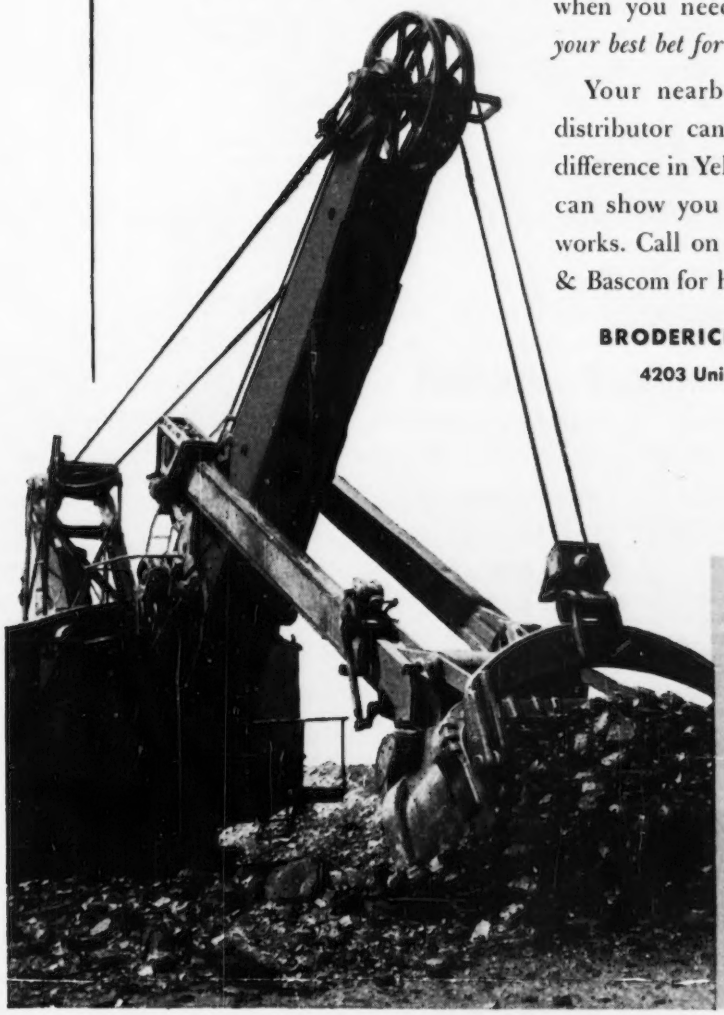

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## British Columbia *(Continued)*

mapped out for about 3,000 ft. Mining width will run 450 ft assuring company of probably more than estimated 7-million tons of ore reported last year.

Unique feature of the mine is that the orebody lies within the permafrost area and in this way the mining is aided by nature which helps separate the fibers from the rock, eliminating much harsh crushing.

Present treatment of 700 tons of ore daily results in about 60 tons of asbestos fiber a day with the 3K fiber (a spinning fiber) retailing at $460 a ton f.o.b. Vancouver.

Transportation of fiber is costly since it is trucked to Whitehorse, freighted to Skagway and shipped to Vancouver.

This cost expected to be materially reduced when a new 300-mi road can be completed to Stewart at tidewater.

## YUKON

**Hudson Bay Mining & Smelting Co., Ltd., has announced that recent exploration of the orebody above the No. 1 exploration level** of the company's Yukon nickel property at Kluane Lake near the Alaska Highway revealed that the body contains some 500,000 tons of ore. Previous explorations had revealed some 250,000 to 275,000 tons of ore in the body.

# IN LATIN AMERICA

## MEXICO

**A frontal attack on the basic problem of the Mexican mining industry,** confiscatory taxation, was carried out at a very dynamic meeting of the Association of Small and Medium Miners of Mexico in Mexico City.

The Mexican Secretary of the Economy and authorities from the Mexican Treasury Department, both of which decide the tax structure for mining, presented projects for a new mining law and reforms on taxation of mining in Mexico.

However, the convention of miners found these suggestions far from satisfactory and almost unanimously agreed that the changes in the tax structures were too insignificant to be worthy of consideration.

**Senator Alberto Terrones Benitez, head of the Mexican Senate Mining Commission** and probably Mexico's most vociferous spokesman for mining interests in general, told the small miners congress that the Government policy on national mineral reserves was harmful to the general welfare of the Mexican economy. "The attitude of certain government officials," Terrones Benitez said, "on the creation of so-called national reserves is entirely negative and has proven to be the source of a depression and stagnation of the mining industry."

**Senator Terrones**

Terrones is backing a revision of Mexican law on mining which challenges the state's rights to restrict any given type of mining operation or to create "official" mining.

It is his feeling that only the constitution, and not executive decrees, can create national mineral reserves, he told the congress.

**A new firm, Cia. Mineral de Autlan, has opened a large manganese operation** at Autlan, in the west central state of Jalisco, some 100 mi west of the city of Guadalajara.

**A new foundry, to be called "Minera de Baja California,"** has been announced for construction at Ensenada, Baja California. Slated to cost approximately $1-


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- **Infinite Speeds**—No gears, but all the advantages and none of the disadvantages of automatic, multi-speed transmissions. An infinite number of speeds at your command without shifting, since speeds and power are automatically balanced at all times.

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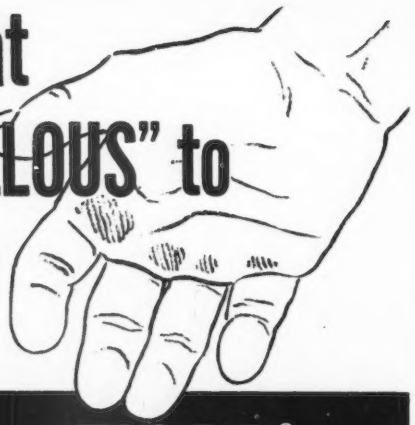

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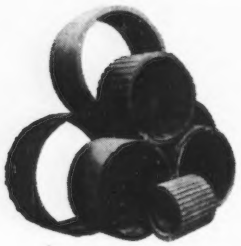

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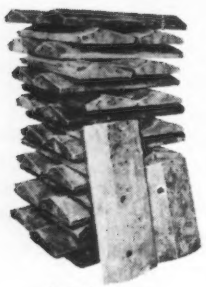

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## Mexico *(Continued)*

million according to reports in the Mexican capital, the plant will have a daily production of 100 tons.

**The new zinc oxide fuming plant in Monterrey,** built by National Zinc interests in conjunction with Mexican interests, has gone into production utilizing the Waelz process. Production capacity was not revealed.

**The new Cia. San Martin lead-zinc flotation** mill, near Sombrerete south of Durango, is in full production. It is a moderate-size operation.

## CHILE

**Compania Minera Tamaya, Coquimbo Province, has started floating the fillings from the famous Tamaya copper mines** which were worked out during the last century but which still contain several million tons of concentrating sulphide ores between fillings and dumps.

**The high price of copper and the abundance of oxidized copper ores in Antofagasta** has been the reason for more than 20 small leaching plants being built in the Province.

**Braden Copper Co. in a report delivered to the Ministry for Mines** has estimated its production for next year at 117,000 metric tons with an average output of between 10,000 and 12,000 metric tons of copper a month.

**Chile Exploration Copper Co. (Chuquicamata), Andes Mining Copper Co. (Potrerillos) and Braden Copper Co. (El Teniente)** have established a seven day work week in order to catch up with production lost as a consequence of the recent strikes and also because of the shortage of copper in the principal world markets.

## PERU

**Export-Import Bank last month said that it is "prepared in principle" to lend $100-million** to Southern Peru Copper Corp., a wholly-owned subsidiary of American Smelting & Refining Co., to aid in development of the Toquepala copper project. The loan is contingent on Asarco's working out financing for an additional $105-million, needed for the $205-million project.

The Toquepala deposit, 60 mi northeast of the port of Ilo, is a secondarily enriched area of sulphide ore. Both a flotation mill and a smelter are included in project plans. Reserves were described as "very large."

An extensive program of both diamond and churn drilling has been completed and only maintenance crews are now at the property. Lester Kitch, an engineer who was in charge of field drilling operations, is superintendent at the property. A. C. Hall, in Lima, is managing director of all AS&R's operations in Peru

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## Peru *(Continued)*

**Churn drilling program has been completed and investigations are continuing at Cerro de Pasco Corp.'s Cuajone Project,** also in southern Peru, near the Toquepala Project of Asarco.

The deposit, largely quartz monzonite, is situated between converging valleys of the Huairuri and Cuajone Rivers in the district of Torata, Province Mariscal Nieto and the Department of Moquegua. This mineralized zone is about 35 mi by road from Moquegua at about 10,000 ft above sea level. It is known as the Chuntacala orebody. J. McK. Pardee and Al Davison are in charge. Newmont Mining Corp. has a 25% interest in the Cuajone Project.

## COLOMBIA

**Ministerio de Minas y Petróleos has announced that Colombia's first bauxite deposit to be exploited** is now being developed by Compañía de Bomboná, Medellín. The deposits are located on 5,000 hectares between the towns of Santa Rosa and Yarumal, slightly northeast of Medellín. The Ministerio hinted at soon letting contracts for exploitation of other bauxite deposits.

**Discovery of manganese deposits 110 mi from the port of Tumaco in southern Colombia** in the area of Mallana has been reported. Ministerio de Minas y Petróleos released details of analysis on one ore sample: manganese, 47.20%; iron, 0.93%; silica, 13.60% and moisture, 1.74%.

## BRAZIL

**The firm of Laminmetal Latinoamericana, Minerais e Metais Ltda., of Belo Horizonte, Minas Gerais,** reportedly has presented to the Bolivian Government a proposal to industrialize the Bolivian copper industry.

The proposed program would begin with an investment of 200-million bolivianos for acquisition of machinery generators, laboratory and other equipment to erect a complete plant for elaboration of electrolytic copper, copper bars and ingots. Bolivian officials were considering the proposal.

## BOLIVIA

**Corporation Minera de Bolivia in a special report released recently said that operations of the Nationalized Bolivian Mining** suffered a loss in 1953 of Bs. 2,112,424,913 (about US$10,562,125 at the official rate of Bs200 to US$1).

In part, the report traced the loss to growing production costs which has forced Bolivia to sell at a loss. For example, the report stated that the average selling price per ton of tin i sUS$1,-801.05 while the production cost (c.i.f.) is US$2,164.71.

Another reason for the loss, the re-

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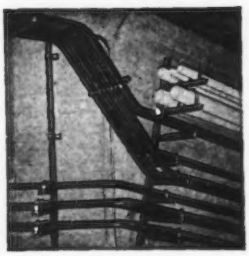

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## Bolivia *(Continued)*

port added, was the decline in production. This was ascribed to "impoverishment in the deposits, lack of qualified technicians, lack of essential materials and supplies caused by systematic boycott, and technical factors of development and exploration."

Corporation Minera de Bolivia, government agency administering the groups of Patino, Hochschild and Aramayo properties after their nationalization, released the following production figures in metric tons:

| | 1952 | 1953 | 1954 (1st 6 Months) |
|---|---|---|---|
| Tin | 27,346.9 | 26,034.0 | 12,396.1 |
| Zinc | 25,305.8 | 21,663.1 | 8,673.1 |
| Wolfram | 1,013.8 | 1,188.0 | 777.6 |
| Silver | 194.6 | 167.2 | 68.0 |
| Lead | 9,807.9 | 9,488.1 | 3,792.6 |
| Copper | 4,076.2 | 3,819.6 | 1,704.5 |
| Bismuth | 32.0 | 53.4 | 25.3 |
| Antimony | 124.3 | 12.5 | 17.0 |

The report closed with a statement indicating urgent need for exploration to increase reserves.

## CUBA

**A pilot plant study of a new process for extracting nickel and cobalt from Cuban ores** will result from an agreement recently reached by General Services Administration and Freeport Sulphur Co.

The agreement provides for Freeport construction and operation of a pilot plant to study on a large scale a new process for production of nickel and cobalt from deposits at Moa Bay on the northeast coast of Cuba.

To be financed by the U.S. Government, the plant will be erected near New Orleans on land recently purchased by Freeport. It will treat 50 tons of ore a day supplied by Freeport without charge to the Government and the work will be done by Freeport at no fee.

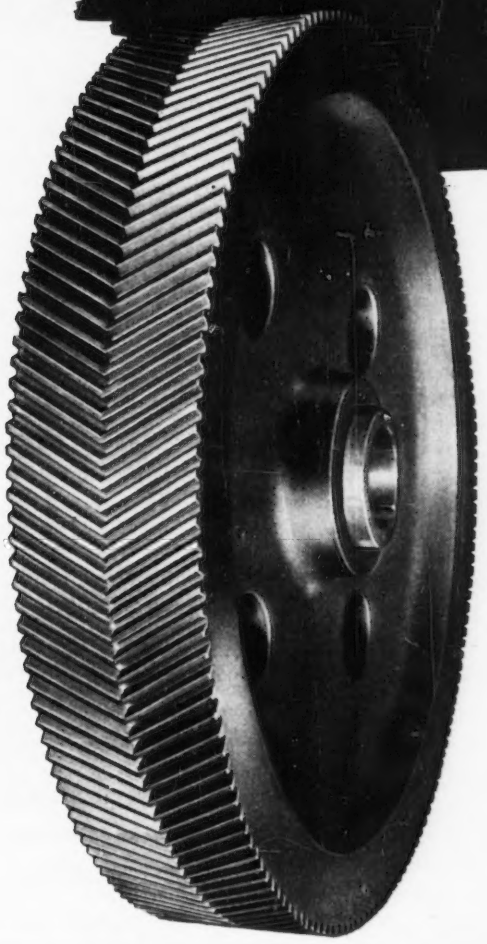
Pilot plant operation will be aimed at bringing nickel resources of the Moa Bay region into commercial production. Test runs will be designed to provide a basis for a commercial plant which would turn out nickel and cobalt to meet direct requirements of the United States as well as steel makers and other industrial users.

Freeport has been financing with its own money the study of certain phases of the process, which includes techniques devised by Chemical Construction Co. The Government proposed the 50-ton pilot program in order to obtain engineering and cost data on a scale to permit maximum assurance of economy and efficiency in the development of a new source of these two strategic metals. The Government will advance up to $6¼-million for construction and operation of the pilot plant.

In addition to the pilot plant agreement, the Government entered into a contract to buy nickel and cobalt from the commercial plant which Nicaro Nickel Co., a Freeport subsidiary, is planning to build upon successful completion of the pilot plant program. This

*(Continued on p. 159)*

# balanced △ design



BALANCED DESIGN . . . adds to the life of Philadelphia Herringbone Gears and Speed Reducers. In addition to the Sykes continuous tooth, Philadelphia also manufactures Staggered or Separated tooth gears of the Herringbone type in sizes up to 150 inches diameter. For heavy duty industrial drives, the Herringbone Gear provides maximum efficiency and economy.

EFFICIENT, because overlapping tooth design provides smooth, quiet power transmission with almost no power loss between gears.

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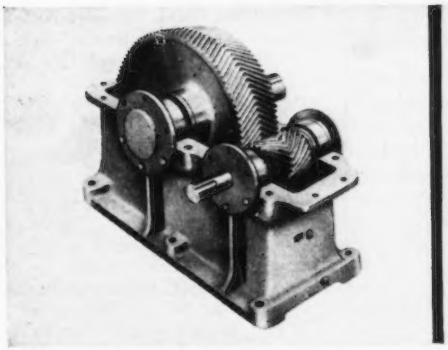
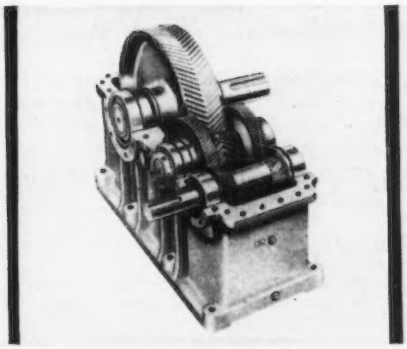
The balanced design of Philadelphia Herringbone Reducers is carried one step further in completely balanced gear units. Philadelphia reducers, illustrated below, show how the Herringbone and opposed helical gears are nestled within one another,—thus providing a wide, stable housing with balanced gear and bearing loads.

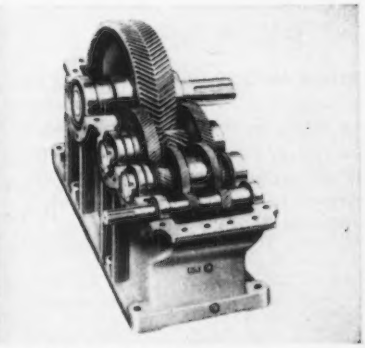
Write for Catalogue H-49.



Single Reduction Type



Double Reduction Type



Triple Reduction Type

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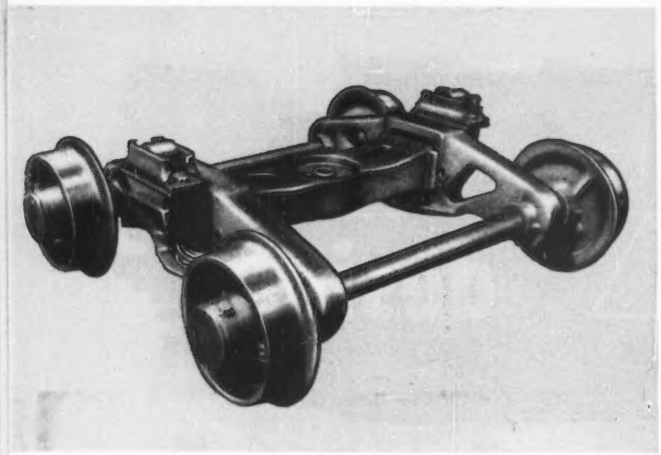

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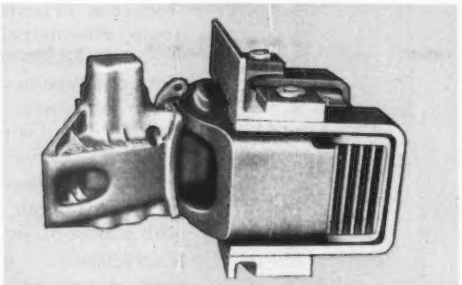
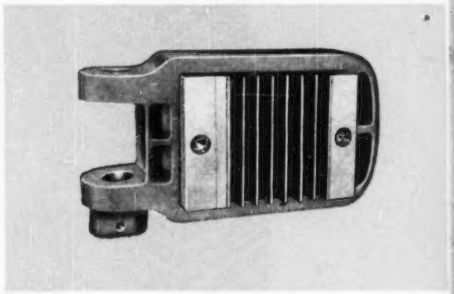
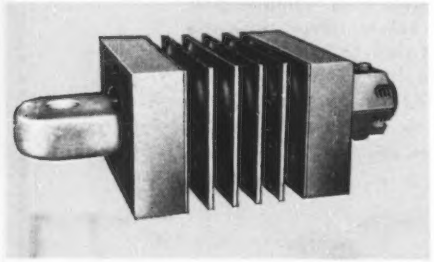


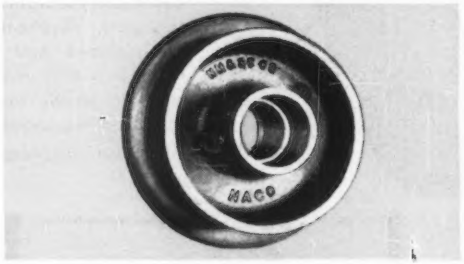
**NATIONAL MI-235** Rubber-Cushioned Draft Gear primarily used in Willison spherical-horn coupler assemblies for drop-bottom cars and locomotives; are effective with link and pin bumpers and in strap yokes.



**NATIONAL MI-225** Rubber-Cushioned Draft Gear for locomotives and large capacity cars not required to operate through rotary dump. Give maximum impact protection in minimum space.



**NATIONAL MI-230** Rubber-Cushioned Draft Gear for cars in rotary dump service. High-capacity rubber pads with soft initial action provide maximum impact protection, lengthen equipment life. Available in capacities and designs to fit individual requirements.

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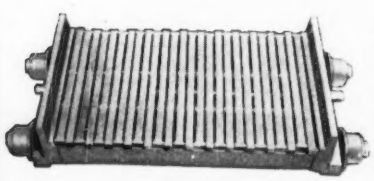

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**NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY** • Cleveland 6, Ohio

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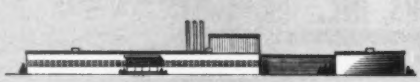


*"Progress through Research"*

## Argentina *(Continued)*

which a big stock has accumulated during the past few years.

**Argentine Government announced Oct. 22 that it would shortly authorize purchase from abroad** of twelve concentration plants for tungsten mineral production.

# IN AFRICA

**Following are statistics of gold mining operations for the first nine months of 1954** with the comparable figures for the similar period of 1953:

Tons milled, 46,320,000 ($43,980,000), working revenue from gold, $324-million ($294-million); working profit gold, $77-million ($74-million); premium gold sales, nil ($5-million); uranium profit, $11,500,000 (02,640,000).

Free State mines included above (working revenue) $23,600,000 ($9,700,000); working costs per ton milled all mines, $5.36 ($5.05); working profit per ton milled, $1.68 ($1.69).

**Roan Antelope and Mufulira Copper Mines** on Nov. 4 gave notice of termination of contract to the Northern Rhodesia European Mine Workers' Union. Union and management were unable to get together on advancement of the African workers in the mines.

**The 900 European members of the Mufulira branch of the Northern Rhodesian Mineworkers Union** have decided to maintain their ban on overtime until Rhodesian Selection Trust Co. retracts its decision to terminate its agreement with the European Mineworkers Union.

**Uranium production is rising sharply. For the three months ended Sept. 30 estimated profit of the seven producing mines** was approximately $5-million compared with $4.2-million for the previous quarter.

Major producers were: Daggafontein, $1.02-million; Randfontein, $1.30-million; Western Reefs, $1.11-million; West Rand Cons., $1.61-million.

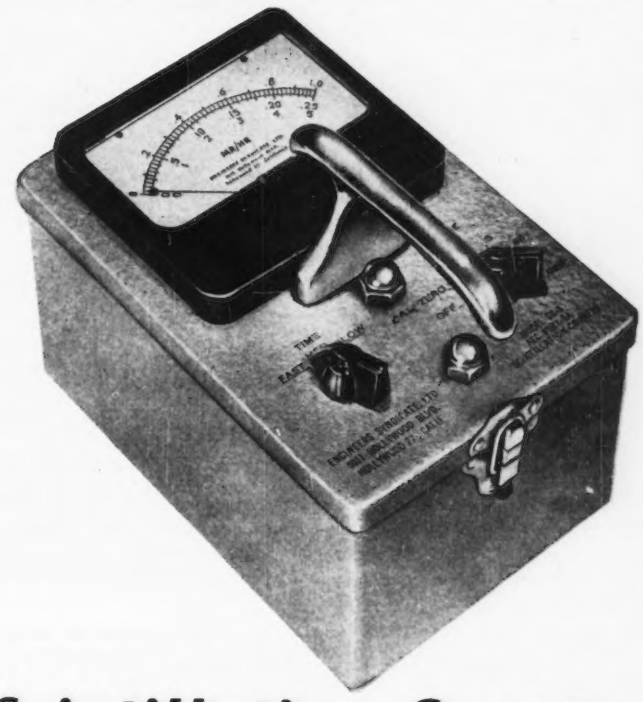
Randfontein's extended plant will be operating by the end of the year. Stilfontein is starting to treat slimes.

**Successful results have been obtained in a pilot plant for the electrolytic recovery of diamonds from drilling crowns** at the Diamond Research Laboratory, Johannesburg. It is held that the methods devised are suitable for plant-scale operation. With slight modification it can be used for the recovery of diamonds from abrasive wheels, it was said.

## LIBERIA

**An Anglo-American group is investigating a large iron ore deposit** in the Putu Hill area. Initial results are said to be very encouraging.

McKay & Schnellmann, geological and mining consultants of London, are in charge of exploratory work.

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EXCLUSIVE FEATURES

- Accurate . . . within ± ½ of 1% of actual weight from maximum to 50% of meter's rated capacity; within 1% from 50% to 25% rate; within 2% from 25% to 10% of rated capacity.
- Automatic totalizer compensation for variations in belt speed and changes in belt weight.
- Responds accurately to rapid load variations.
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Write for Bulletin 550-H4. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 391 Harris Avenue, Providence 1, Rhode Island.

BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC.
METERS FEEDERS CONTROLS

## ARGENTINA

**Sominar's new 500-ton concentrator at Los Condores is slated to begin operation** early in 1955. Three smaller plants will be erected at subsidiary mines of the company.

**Fábricas Militares is installing a 300-ton sulphur flotation plant** at La Casualidad for treatment of autoclave "ripios" of which a big stock has accumulated.

## VENEZUELA

**A new Venezuelan firm, known as Amveco, reportedly will invest several million bolivares** (about 3 Bs to $1) to develop asbestos resources in this country, particularly in an area around Tinaquillo. Tinaquillo is in the central state of Carabobo, south of Lake Valencia.

## AUSTRALIA

**An advanced type of nuclear reactor will be constructed near Sydney** for research into the use of atomic power for industry.

The project is part of a cooperative program of atomic energy research between the governments of Australia and Britain. Australia alone will spend more than $12-million during the next five years.

The Australian government believes that production of electric power from nuclear sources will become an economic proposition within "probably the next ten years."

Confidence in the economic success of reactor power plants in Australia stems from the fact that some important economic centers are located far from the coast and from hydrocarbon fuel sources or coal. Such centers are the Barrier mining district, which includes the world's biggest zinc-lead lode, and the Kalgoorlie Golden Mile.

Mining for uranium is also carried on in districts remote from orthodox fuel sources. If these mining operations grow, they could utilize a portion of the output on the spot.

However, the experimental plant will be located just near enough Sydney as safety considerations will allow, and as near a source of sea or fresh water as possible.

Professor J. P. Baxter, deputy chairman of the Australian Atomic Energy Commission, disclosed that the reactor will have a capacity of 10,000 kw. This is said to be twice the capacity of the largest comparable installation at the British atomic research station at Harwell.

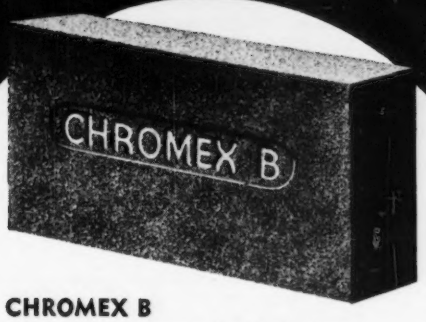
**First tests at Mary Kathleen Uranium Lease, near Mount Isa, Queensland,** reportedly have indicated that a square-mile field contains 1,350,000 tons of high-grade ore.

This was reported after a preliminary geological survey by Australian Oil Exploration Ltd., which bought the lease from a Queensland syndicate.

for maximum life of furnace linings . . .

HARBISON-WALKER

# BASIC REFRACTORIES

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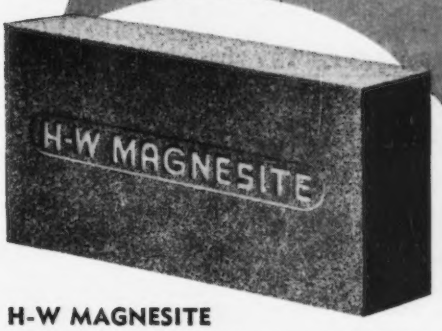


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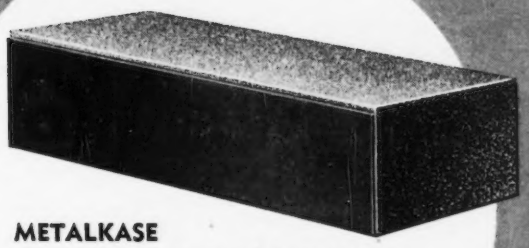

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# IN ASIA

## INDIA

**Some 750 sq mi of India's state** of Vindhya Pradesh (north central India) are capable of yielding $25-million of diamonds annually, according to the findings of a technical report submitted by three Russian mining engineers.

The Russians, V. I. Tikhonov, Shvezov and Zerebtzov are on loan to the Indian Panna Diamond Mines.

This Russian trio computes that when fully mechanized, the annual output of the mines for 315 working days would be about 596,295 carats. Ore reserves, say the experts, "are vast and even working on the basis of a 10,000-ton capacity plant, the mines should continue to produce diamonds for the next 25 to 30 yr."

Panna Diamond Mines Co. now is negotiating with the Soviet Government to purchase heavy equipment. The Russian surveyors have already drawn up working plan which the company has accepted.

**A meeting in London during October between Indian Finance Minister Deshmukh** and British Chancellor of the Exchequer R. A. Butler carried to a further stage the British proposal to build a steel plant in the private Indian sector.

Britain has put forward two proposals. The first is for a plant with an output of 675,000 tons costing around $125-million. The other is for a million-ton plant at an additional cost of about $30-million. Both proposals lay down that 60% of the capital outlay will be provided by British steel interests, at 4% interest. The plant would take 3 yr to build.

Unlike the Russian offer, which is purely to New Delhi, Britain has asked that Indian capital be associated with this venture, which would be run as a private enterprise with Government's financial aid.

A team of British experts and surveyors were to arrive in New Delhi in November at the same time that Russia will send her own technicians. But before any of them can get down to work, the Government of India must decide whether steel expansion is to be put in the category of state enterprise or whether private participation is to be permitted.

The Government already is committed to build its own $210-million steel plant, (in partnership with Krupp), at Rourkela in Orissa. It also has given a $20-million loan to Tata, who are expanding their own steel works at Jamshedpur, in Bihar (East India).

## RUSSIA

**Russia has announced discovery of large dolomite powder deposits** in the region of Sudogda, about 125 mi east of Moscow. Open pit mining already has begun, and production is scheduled to reach a million tons annually by 1957.

## INDONESIA

**Djakarta sources reported that Indonesian tin in ore shipments** during September totaled 3,747 tons compared with 2,837 tons in August. This brought shipments for the first nine months of 1954 to 24,072 tons against 23,385 in the corresponding period in 1953.

## MALAYA

**A large number of Chinese tin mining companies and individuals** in recent months have surveyed some old Columbite findings in Johore around Paya Bakri and some have pegged claims and started working them, according to the Johore State Government.

The findings had been discovered before the war but they had not been worked because of lack of demand.

The possibility that Malaya will produce 60,000 tons of tin-in-concentrates during 1954 continues, according to the Chamber of Mines. It reports that the estimate of the export duty on tin for 1954 has already been exceeded by 1,400,000 Straits dollars.

At the end of September 77 dredges were in operation (unchanged from August) 540 gravel-pump mines (532) and 75 other mines (80), giving a total of 692 (689) tin mines.

## JAPAN

**Japan's titanium industry is expanding fast.** Production for the current fiscal year (April 1954 through March 1955) is estimated at 1,200 tons, ten times as large as in the preceding year.

Osaka Titanium Industry Co., largest producer, opened a 25 ton-per-month plant in February in addition to its old nine-ton plant. The firm plans to build another 25-ton plant early next year.

Toho Titanium Co. opened its first 20-ton plant in March, and is building additional 10-ton plant.

Japan Soda Industry Co. now has a three-ton plant, but will start construction of 30-ton plant by the end of this year.

Japan Electrical Metallurgy Co. has a five-ton plant, and will add a 20-ton plant soon.

Mitsui Metal Mining Co. has a one-ton test plant now, but will start full scale production toward the middle of 1955.

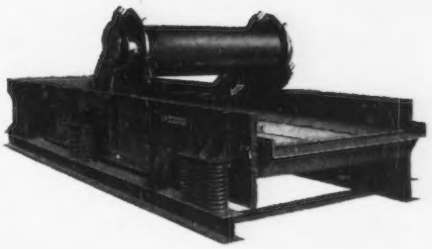
From January through August, these firms produced 315.671 metric tons of titanium sponge. January total was 10.844 tons but August production reached 61.539 tons owing to the expansion of Osaka Titanium and Toho Titanium.

Company-wise, Osaka Titanium produced 161.534 tons during the same period, Toho Titanium 112.393 tons, Japan Soda 20.933 tons, Japan Electrical Metallurgy 17.7 tons, and Mitsui Metal Mining 3.111 tons.

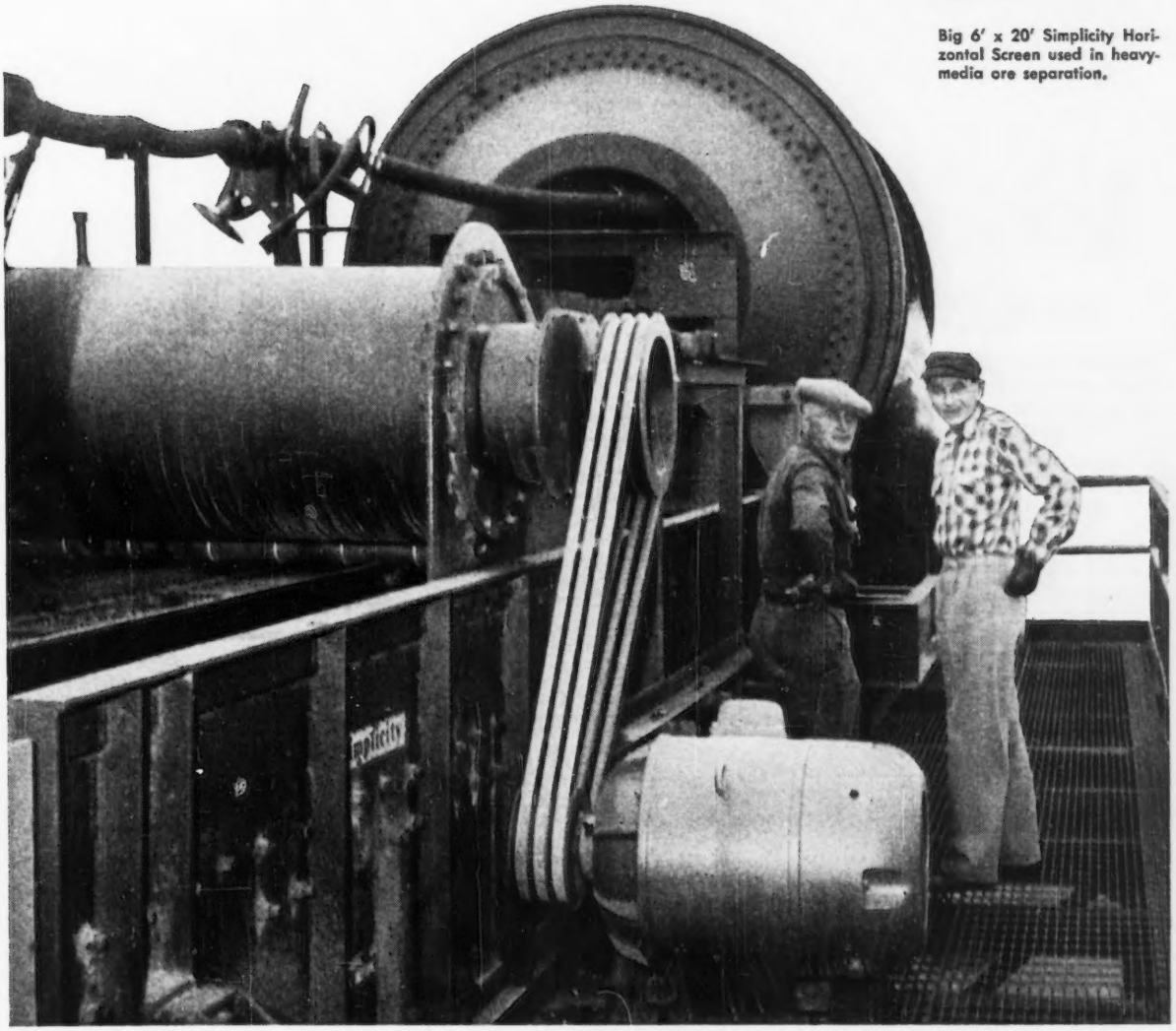
More than half of the production was exported to the U.S. and England. During the first six months of this year, Osaka

# Simplicity screens perform efficiently in heavy-media ore separation plants

Simplicity Horizontal Screens, built to perform efficiently even when headroom is at a minimum are in dependable daily operation in all phases of the mining industry. The Simplicity 6′ x 20′ Screen shown in operation in the photo is installed in a Michigan gravel plant for the production of improved gravel heavy-media separation. This is the same type of screen that has been used so successfully on the Minnesota iron ranges for dewatering and "sink-float" ore separation operations. This 6′ x 20′ unit, incidentally, is the largest of its type ever built. It's rugged and dependable and easily maintained. Complete shaft assemblies can be changed in 30 minutes time. For complete information about these screens and other Simplicity equipment, call your nearest Simplicity sales engineer or write us in Durand.



Big 6′ x 20′ Simplicity Horizontal Screen used in heavy-media ore separation.

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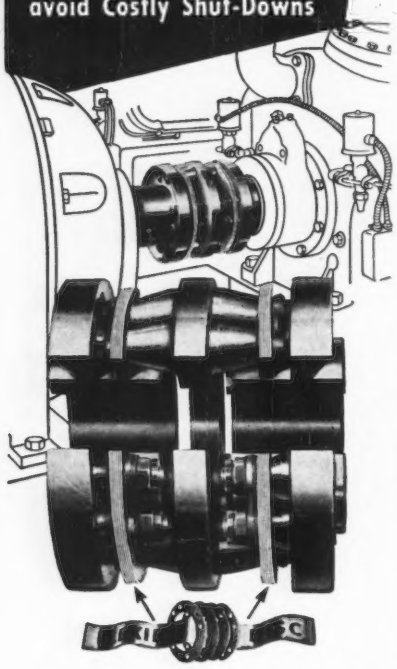

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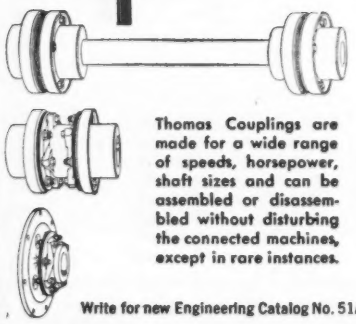

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Titanium, Toho Titanium and Japan Soda exported 64.043 metric tons to the U.S. and 52,838 tons to England, the total representing 60.5% of production for the same period. Of the total export, Osaka Titanium took 70.842 tons, or 60%.

# IN SCANDINAVIA

## SWEDEN

**Boliden Mining Co., Boliden,** inaugurated what was called the largest ore concentration plant in Europe in September. The plant will have a capacity of 500,000 tons a yr, and is part of 5-yr program aimed at a total annual mining and refining capacity of more than 1.6-million tons.

Plant is part of a Kr.125-million ($25-million) expansion plan, one-fifth of which was spent on the concentrator.

Boliden's 10 mines, all located in the same district of northern Sweden, have an estimated ore deposit of 42-million tons, consisting of iron and copper pyrites, galenite, zinc-blende and some gold and silver. About 60 tons of silver and two tons of gold are produced annually.

Modern flotation methods extract the varied components of the Boliden ores. Iron pyrites, largest mineral recovered (about 410,000 annually) are consumed by Swedish wood processing industries; zinc concentrate is sold to Belgium and Norway; 12,000 tons of copper and 21,000 tons of lead are used by Swedish consumers.

Transportation is by 25-ton trucks, cableway and underground railways.

**Sweden was Europe's second largest producer of iron ore,** preceded only by France.

During that quarter (latest for which OEEC figures are available) the French production was 3,512,000 tons a month and the Swedish, 1,258,000 tons. Average metal content of the Swedish ore was 60%, against 33% for the French, Swedish sources said.

## NORWAY

**The iron-ore works at Narvik, north Norway, now have started trial runs** on their new ore-loading plant, which is to be the largest and most modern in Europe. It is hoped to start operations in the first half of January 1955 and to complete the whole plant by the end of 1955.

The new plant has a transport capacity of 4,000 tons an hour, giving a maximum capacity of about 15-million tons per annum. This year, shipments of ore over Narvik are expected to total about 8-million tons.

**Electrokemisk A/S, is planning to build a new aluminum plant** in Mosjoeen, in northern Norway. The plant, which will employ about 250 people, is expected to produce about 20,000 tons of aluminum a year for export.

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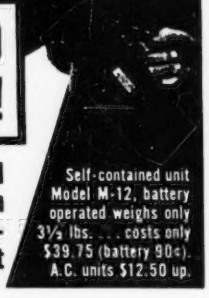

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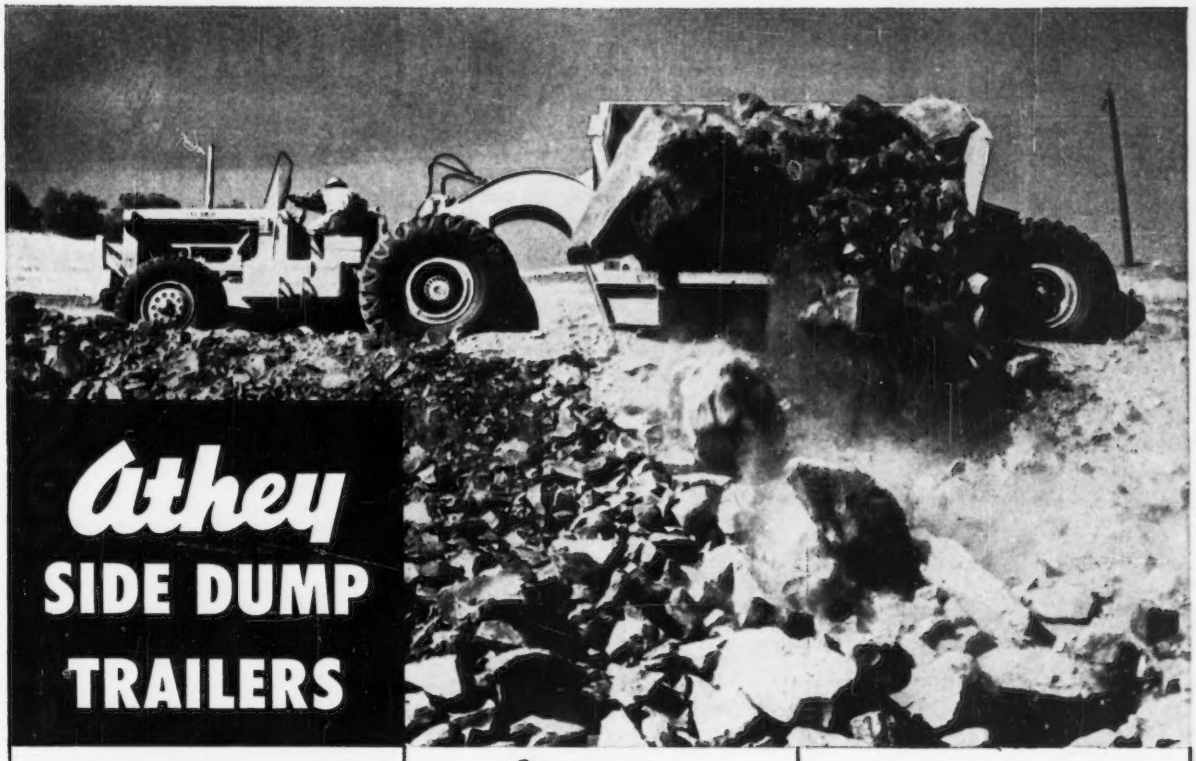

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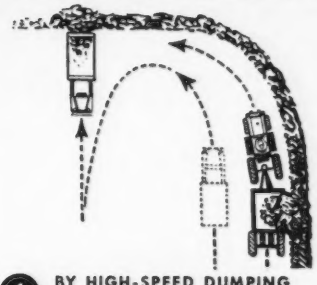

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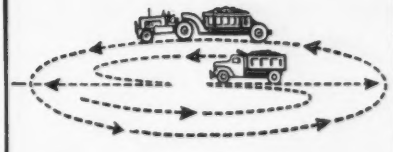

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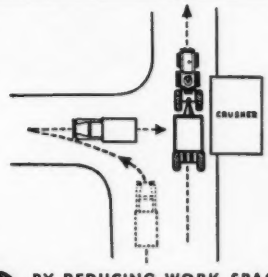


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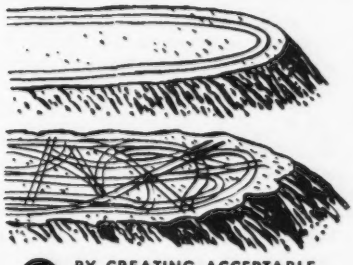

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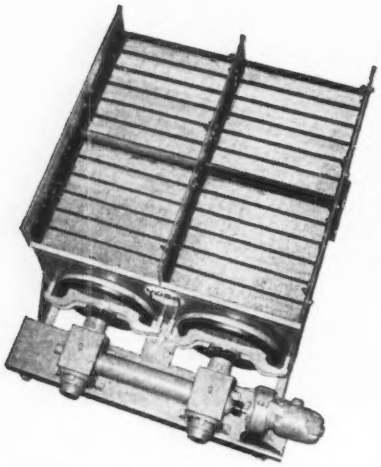

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## FINLAND

**A new copper and zinc mine, with annual production estimated** at 400,000 tons of ore, has gone into production at Vihanti, about 50 mi south of Oulu in northern Finland.

Officials of the state-owned Outokumpu Corp., which is operating the new mine, estimate that the Vihanti ore deposit contains at least 6-million tons of copper, zinc and lead ore, plus deposits of sulphur and magnetite.

Of the annual production of 400,000 tons, about 300,000 tons is expected to be lead, zinc and copper ore. The ore is said to contain, on the average, 12.5% zinc, .85% copper and .5% lead.

It is estimated that the ore will provide annually about 64,000 tons of zinc concentrate, 7,500 tons of copper concentrate, 1,800 tons of lead concentrate and 50,000 tons of sulphur concentrate. Copper concentrates are to be shipped to the Harjavalta smelter near Pori, while zinc and lead concentrates are expected to be exported.

Development of the property was begun in 1951, and included the provision of housing for 400 persons. Two shafts, one 1125 ft and the other 808 ft in depth, have been sunk and connected with a 2000-ft drift.

**Officials of Finland's state-owned Otanmäki Mine say that almost the entire production** of the recently-opened mine this year is being sold to Poland.

The mine, located in the north of Finland, has been in production for less than a year and it is estimated that production of iron concentrate will reach about 130,000 tons. Of this, 120,000 tons is being delivered to the Poles.

# IN EUROPE

## SPAIN

**Construction is to begin this month of a new mill for Fluoruros, S. A.,** a leading fluorspar producer in Spain. The new mill, part of a $1-million development program, is to be financed in part by a $400,000 Export-Import Bank loan.

Contract to install the heavy media separation plant has been awarded to Southwestern Engineering Co., Los Angeles. SWECO will provide technical personnel during the construction period and carry forward a training program for Spanish personnel.

The plant, to have an estimated capacity of 400 tpd, is slated for completion early in 1955. It will produce acid grade fluorspar, which is basic to the processing of steel.

Fluoruros now operates two mines and a mill. The new mill is being erected in the Pyrenees.

William Kuster, mining engineer and fluorspar specialist, formerly with Ozark Mahoning Co., has been appointed director of operations for the new mill project.


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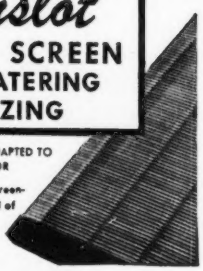

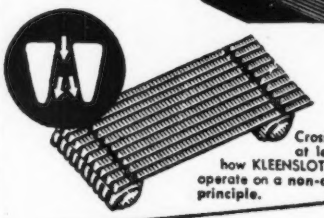

Cross section at left shows how KLEENSLOT Screens operate on a non-clogging principle.

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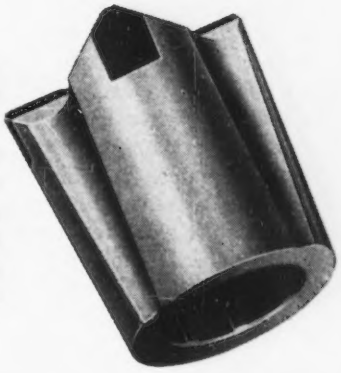

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# 1954 Iron Ore Shipping Season Moved Lowest Total Since 1939


E. S. TILLINGHAST
*E&MJ* Iron Country Correspondent


DURING THE LATTER part of 1953 and the early months of 1954 the stripping programs carried on at many Mesabi Range open pit mines were predicated on a 1954 ore season approaching that of 1953. But as time passed and steel plant operating percentages went down, iron ore schedules for the 1954 season were revised and revised again—always to lower figures.

Because the immense tonnage shipped down the Great Lakes in 1953 was not followed by a correspondingly large steel production, more ore was on hand at lake ports and furnaces in the spring of 1954 than had been anticipated. Consequently the usual spring urgency to begin the new shipping season was missing.

First ore from the Mesabi Range left the Fraser Mine of the Oliver Iron Mining Division on April 16. Other Oliver mines at Hibbing, Ely, Virginia and Eveleth and M. A. Hanna Co. mines at Nashwauk began at about the same time.

The 1954 season opened at the Menominee Range port of Escanaba, Michigan, on April 19 when the steamer E. J. Block of the Inland Steel Co. arrived. Ore for the Block came from Inland's Greenwood Mine at Ishpeming on the Marquette Range. First shipments to dock from the Menominee Range, however, were made by Pickands, Mather & Co. on April 14.

Michigan Conservation geologists at Lansing early predicted that the 1954 season would be slow and probably completed by Nov. 15. Except for the termination date, this prediction has proved quite accurate, in spite of hopes that it was too pessimistic.

Total iron ore shipments from the Lake Superior area on June 1 were 11,476,258 tons which was 10,837,219 tons below those for 1953. Every Lake Superior ore shipping port shared in the decline. As the season progressed the loss, as compared to 1953, grew bigger. By Aug. 1 it had become about 17¾-million tons; by mid-August it had passed 20-million tons and by the end of August it had reached about 23-million tons. Although steel production did begin to pick up in September and October it came too late to have any immediate effect on ore shipments from the mines. The unused remainder of the great 1953 tonnage still seemed sufficient to provide for the relatively small increase in consumption. Another case of "too little and too late."

In September, however, because of greatly decreased shipments during the 1954 season, stocks of ore on hand at furnaces and Lake Erie docks were only slightly above the 1953 figure for the same date: 45,732,804 tons compared to 45,579,307 tons. This brought the ore on hand situation in better position to benefit from any future increase in consumpton of ore at the steel plants.

Some oreboats began to be laid up for the season very early and, by Aug. 1, 75 carriers had been removed from service. Oct. 1 found 1954 well over 28-million tons behind 1953, and by the middle of October the gap had widened to more than 30-million tons. Each week the 1954 total fell still farther behind. By Nov. 1 the differential had become nearly 33-million tons: 57,885,746 tons compared to 90,733,018 tons on Nov. 1, 1953. There were some late minor increases in ore schedules at a few mines, which were encouraging as indicating a trend rather than as important additions to the season's shipments.

Most washing plants had closed by the middle of October, but many continued to ship from stock-piled accumulations.

As of Nov. 8 the Great Northern R.R. docks at Allouez, Wis., had 39 boats scheduled for loading with the probability that some of the list would make at least one more trip before the season closed. As of that date the Great Northern had handled about 450,000 tons of ore in November and had 28 mines still on the active list—mostly of the M. A. Hanna Co., Pickands, Mather & Co. and the Cleveland-Cliffs Iron Co.

The Oliver Iron Mining Division had completed its season in the Hibbing-Chisholm district during the first week of November, but still had a small tonnage to load from the Virginia-Eveleth district.

As of Nov. 8, it appeared that the total Lake Superior shipments (not including Canadian ore) will be about 60-million tons, as compared to more than 96-million tons in 1953, or 62½%. The season was expected to end about Nov. 28 with the M. A. Hanna Co. mines being the last shippers as they were among the first.

The 1954 season marked the 70th anniversary of the first shipment of iron ore from Minnesota. It came from the Soudan Mine on the Vermilion Range in 1884.

The season saw the largest boat load of ore ever moved on the Great Lakes when the new George M. Humphrey (M. A. Hanna Co.) on her maiden trip on Oct. 15 took on 21,762 tons. She is expected to continue in service until the season ends.

First entire boat load of taconite concentrates sinter left Duluth on May 3 by the steamer William B. Schiller of the Pittsburgh Steamship Division, from Oliver Iron Mining Division's Extaca plant at Virginia. This may be a notable date in future records of taconite concentrate shipments from the Mesabi.

First shipment from the Morton Mine of the M. A. Hanna Co. occurred in June. On July 31 the first cargo of iron ore from the Quebec-Labrador field of Iron Ore Co. of Canada was loaded at

Seven Isles. The field was officially opened on that date.

Another of 1954's firsts came on Sept. 13 when Oliver's Plummer Mine near Taconite produced its first concentrates.

During the year the Cayia underground mine of Inland Steel Co. at Crystal Falls, Michigan, was permanently closed.

Menominee Range mines do not have a large stockpile carryover of ore and most of them have shipped enough ore to provide room for the 1954-'55 winter stockpiling.

The 1954 season has the distinction of having made the lowest total shipment since the pre-war year, 1939, when 45,436,667 tons left the Lake Superior district (1940 had 63,948,846 tons). Except for 1937 which had 63,219,208 tons, the shipments through all the 30's were low by present standards. The 1932 total Lake Superior area shipment was only 3,588,608 tons which could have been made from any one of several Mesabi Range mines,

Season just closed was the first full season since 1939 when iron ore requirements were not affected by the demands of an active war or of an imminent one. With that in mind the comparison with shipments during the last 25 years is not unfavorable.

The 1955 season is being anticipated with a restrained optimism that iron ore production may exceed that of 1954 even though falling below the record of 1953.

## Battelle To Enlarge Nuclear Research Efforts

BATTELLE MEMORIAL INSTITUTE, Columbus, Ohio, has announced plans to expand its nuclear energy research facilities with an additional $1,535,000 appropriation. Construction of a nuclear reactor, reactor development laboratory, nuclear fuels laboratory and cobalt-60 source is planned.

Battelle holds contracts for research for the Government and for private industry and is at present operating a $2-million research development program.

## ODM Authorizes Sale Of GSA-Held Copper to Trade

GSA WAS AUTHORIZED to sell 17,500 tons of copper accumulated under the Defense Production Act to fabricators to relieve shortages caused by recent strikes in the copper industry in mid-October. In addition, about 9,000 tons destined for the stockpile could be diverted if, the ODM order said, "suppliers desire to make such arrangements."

The copper was sold "at U.S. market prices, plus handling charges" in order to "help prevent enforced idleness in copper-consuming plants as a result of recent work stoppages in copper mining, smelting and refining industries."

Possible deferral of November deliveries would be "evaluated at a later date," the order said.


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## FRANCE

**French Commissariat a l'Energie Atomique** on Nov. 1, began purchasing mineral uranium extracts from private sources located in France, mainly Brittany, Normandy and the Massif Central area.

The Commission requires the uranium in lots of not less than 20 tons, at a price to be fixed at 4,000 francs (about $12) for each kilo of uranium to be found contained in the mineral, estimating that this should include a minimum of about 0.2% uranium metal.

In addition, 1,000 francs (about $3) each kilo of uranium contained in the ore bearing more than 4 for 100% will be paid as a supplemental premium.

The above offers made by the Atomic Energy Group will be good for a 5 yr duration. The C.E.A. also will provide gratis trained technicians to analyze the ore content.

**Output of iron ore in France for the first nine months of 1954** totalled 32,061,000 tons, compared with 31,407,000 in the corresponding period of 1953.

Deliveries to consumers amounted to 30,655,000 tons against 31,027,000 in January-September 1953. The domestic market received 17,815,000 tons (18,724,000) and the Saar 4,534,000 (4,928,000). Exports reached 8,307,000 and 7,375,000 tons respectively.

Output in the third quarter of 1954 rose to 10,704,000 tons from 9,347,000 in the corresponding quarter of 1953.

Deliveries to French consumers reached 6,285,000 tons compared with 5,198,000 in July-September 1953. Deliveries to the Saar amounted to 1,593,000 tons against 1,717,000, while exports totalled 2,827,000 tons compared with 2,271,000 in the third quarter last year.

## BELGIUM

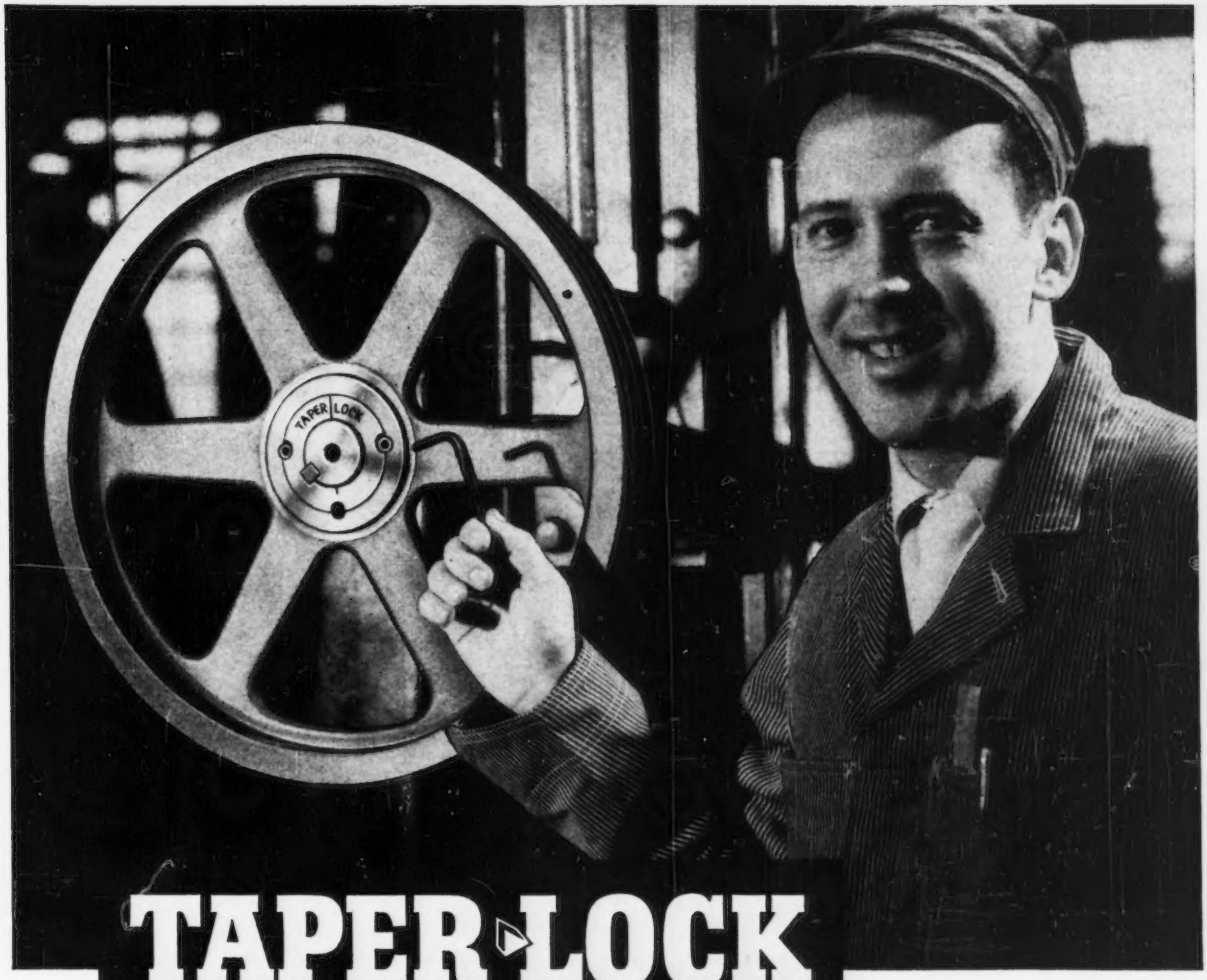
**Union Miniere du Haut Kaanga, which owns and operates the famed Shinkelobwe uranium mine in the Belgian Congo,** last month became the first company ouside of the U. S. to join the Atomic Industrial Forum Inc. — the American industrial association devoted to advancing the peacetime development of atomic energy.

The Shinkleobwe mine was a principal source of uranium for the U. S. atomic energy program during World War II and has remained a primary source.

Alexander Wust, Director General of Societe d'Electricite de l'Escaut, Antwerp, Belgium, became the first individual affiliate; Union Miniere is the first organization affiliate.

## AUSTRIA

**The nationalized Mitternberg Copper Mining Co.,** considerably aided by the ERP program, has achieved a 5.9% increase in yield, during the first half of 1954, over 1953's first half-year, by pro-

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ducing 78,340 metric tons of copper ore.

Copper concentrate production during the same period was 3.1% above the 1953 level, totaling 5,306 metric tons, with a metal content of 1,512 tons. Productivity at the same time rose 5% per ton and shift.

The processing plant at Brixlegg turned out during the first half of 1954: 4,428 tons of cathode copper, 1,435 tons of copper sulphate, and 63 tons of nickel sulphate. One-third of the material for cathode copper stems from the Mitternberg mines. Less than 10% comes from Germany for re-export to Germany, while the rest is made up from scrap and waste remaining after copper processing.

More than half of the 1954 nickel sulphate production went to the U.S.,

## SWITZERLAND

**Switzerland and Belgium recently signed an agreement for delivery by Belgium of 10 metric tons of uranium** for Switzerland's atomic pile, now under construction.

Reports from Geneva say that the ore will be delivered by the Union Minière du Haut-Katanga in the Congo and will be treated in Great Britain before shipment to Switzerland.

## YUGOSLAVIA

**Yugosalvia and Bolivia in October signed a one-year barter agreement** under which each nation will exchange valued at $500,000.

Bolivia is to export tin, wolfram and copper concentrates, sulphur and other non-mining materials. In exchange, Yugoslavia is to export pneumatic machinery for mining plus other mechanical, chemical and agricultural products.

The agreement, renewable for sucessive one-year periods, was signed by Dr. Walter Guevara Arce, Bolivian foreign minister, and Dragutin Djurdjev, Yugoslavian representative.

## POLAND

**Test production began Sept. 2 at Poland's first basalt smelting plant,** located at Starachowice. An adjoining factory will produce basalt pipe sections and plates for Polish industry.

## HUNGARY

**Hungary is helping Czechoslovakia build a reduction plant** in Slovakia Province where Hungarian bauxite is to be processed with Czech electric power. Hungary's scarcity of electric power prevents domestic operation of any large reduction plant.

# IN THE NEAR EAST

## TURKEY

**Negotiations were underway last month for possible delivery of 200,000 tons of Turkish chromium ore** to the United States under a triangular arrangement between Turkey, the U.S., and Germany. This was reported in Hamburg by the Norddeutsche Bank, which added that the negotiations in Ankara appeared favorable.

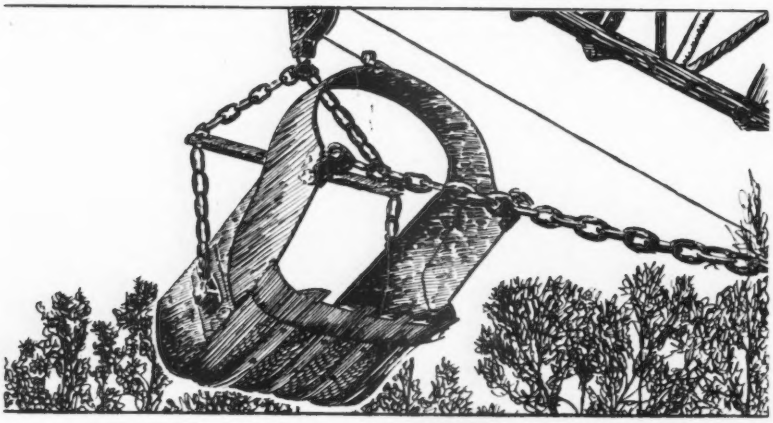
Value of the chromium ore would be credited to Turkey's account under the West German-Turkish clearing arrangements. In exchange, the U.S. would deliver grains and fats to West Germany.

## LEBANON

**German groups have shown interest in rich iron ore deposits** discovered at Tannourine, high up in the mountains in northern Lebanon, Beirut reports revealed.

Swiss experts have estimated the deposits at 100-million tons. Lebanese iron ore deposits contain from 62 to 85% metal, it was claimed. Lebanon is said to be one of the richest countries in iron ore in the Middle East.


RM FOR MEDIUM DIGGING



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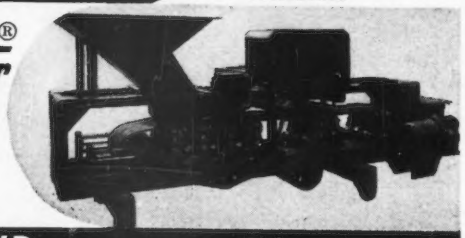

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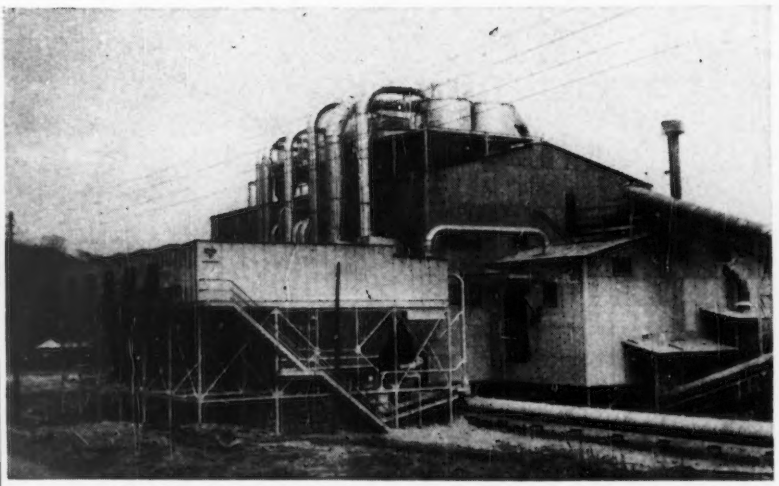


**NEW MILL** boasts an initial capacity of 20,000 tons high-grade fiber annually.

# Johns-Manville Opens New Mill In Africa

## Two More Asbestos Mines Begin Producing

JOHNS-MANVILLE formally placed two more asbestos mines into commercial production Nov. 25 with the opening of a new central mill at Mashaba, Southern Rhodesia.

The new mill, which has an initial capacity of 20,000 tons of fiber annually, is serving two mines: Temeraire Mine, adjacent to the mill, and Shamala Mine, 4 mi away.

Mining and milling of the chrysotile ore is carried on by Rhodesian Asbestos Ltd. under direction of Canadian Johns-Manville Co. Ltd., associated with British Metals Corp. Ltd., Anglo-Huronian Ltd. and the Simon I. Patino interests.

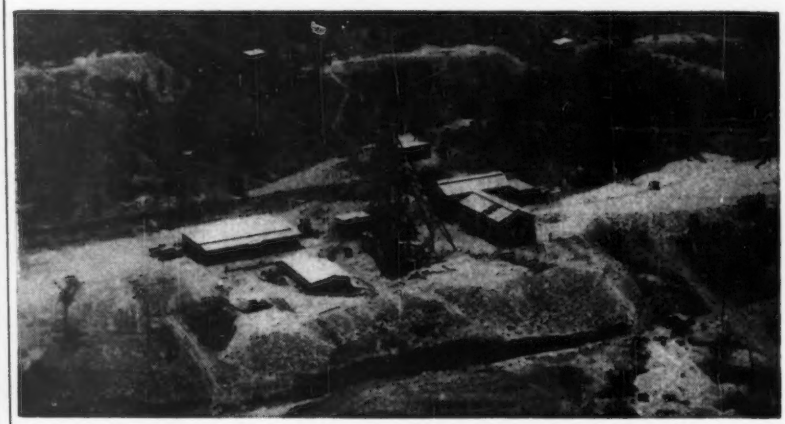
Both mines are highly mechanized. Each has a 550 ft shaft. Ore from the Shamala Mine is hauled in by 15-ton diesel trucks. Processed fiber is trucked out from Mashaba to a railroad at Fort Victoria from where it is shipped to Beira, Mozambique, for water transport to Europe and the United States.

A. R. Fisher, president of both Johns-Manville Corp. and Rhodesian Asbestos Ltd., who flew from New York for the ceremony, and James R. Ewing, general manager of Rhodesian Asbestos Ltd., say that the J-M Mashaba operations comprise the most modern plant in Southern Rhodesia for mining and milling high quality asbestos fiber.

In addition to the two mines and new mill, which has a capacity of 125 tph, there is a modern drying and crushing plant and an 8,000-ton dry rock storage facility.

Among others who participated in the opening ceremony were Prime Minister R. S. Garfield of Southern Rhodesia; G. A. Davenport, Minister of Mines; Karl V. Lindell, vice president of Canadian J-M and managing director of Rhodesian Asbestos Ltd., plus other dignitaries from Fort Victoria, Bulawayo and Salisbury.

On Sept. 30, J-M dedicated the world's largest asbestos mill (*E&MJ*, October 1954, p 120).



**SHAMALA MINE,** 4 mi from mill, is one of two asbestos mines served by the plant.

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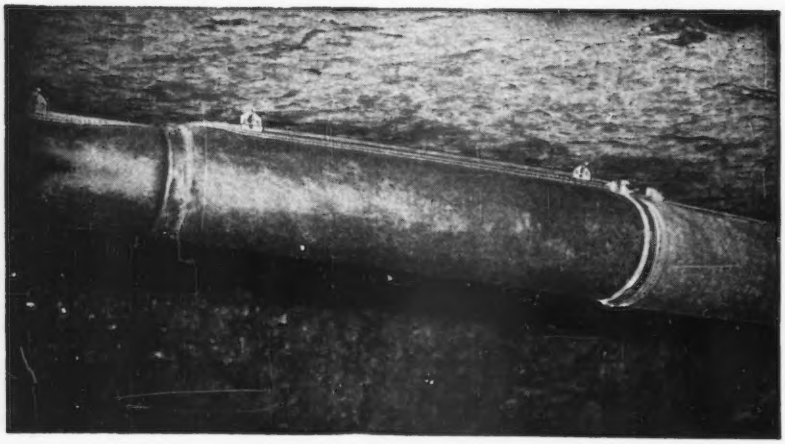

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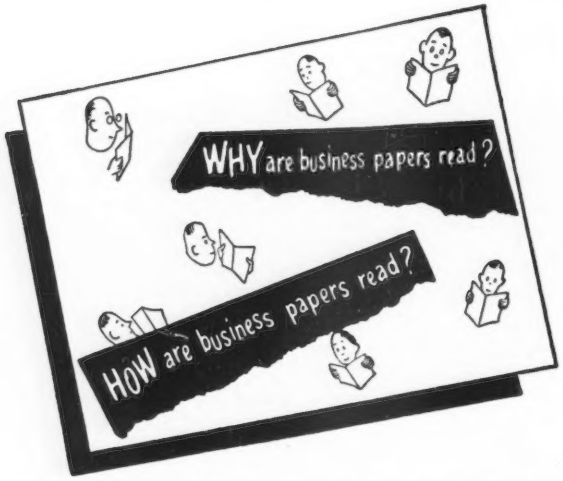


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## Personals (*Continued from p 108*)

tiring from active service at the end of 1954. He will also retire as president and director of the Southwest Potash Corp., Carlsbad, Compania Minera de Penoles, S.A.; Compania Metalurgica Penoles, S.A., Mexico, company-owned properties, and as chairman and director of Tsumeb Corp., South West Africa.

**George Sundeen,** Ishpeming mining engineer, is now with North Range Mining Co. on the Marquette Range in Michigan.

**Thomas Condon** has been appointed senior engineer of the industrial engineering department and **H. Lee Crouse** has been named to special projects for Calumet & Hecla.

**Kenneth F. Farley,** assistant controller, has been named assistant smelter manager for C&H, succeeding **Raymond J. Marcotte,** new special technical assistant to the general manager of the Calumet division.

**Charles F. Willis,** Phoenix, secretary of the Arizona Small Mine Operators Association, has been appointed to the national council of consultants to the U.S. Government's Small Business Administration.

**W. C. Page,** vice president and general manager of western operations for U.S. Smelting, Refining and Mining Co., asked to be relieved of those duties for reasons of health and was named vice president and consulting engineer by the executive committee of the company. **Oscar A. Glaeser** was elected vice president and general manager of western operations.

**W. D. Jamieson** has been appointed general superintendent of Quemond Mining Corp. Ltd., succeeding **J. A. Graham,** who left Quemont to join Geco Mines, in Ontario. **George Dimitrieff,** former assistant mine superintendent, fills the position vacated by Mr. Jamieson and is himself succeeded by **J. A. Hambleton.**

**Neil S. Edmonstone** has been elected vice president of Steep Rock Iron Mines.

**W. W. Bake** has been appointed manager of Stadacona Mines, Noranda district, succeeding **Arnold Sobering** who left his position as manager to join Geco Mines, Manitouwadge.

**R. S. Andrecheck,** Steep Rock Lake, Ont., was recently placed in charge of open pit operations in addition to his duties as hydraulic operations chief.

**E. T. Walton,** chief metallurgist at Crucible Steel's Midland, Pa., operations, has been transferred to the company's offices in Pittsburgh, where he will serve as metallurgical engineer.

**Richard G. Graham,** formerly with Emperor Gold Mining Co. Ltd., Fiji, is now underground manager for Australian Development, N.L., Tennant Creek, Australia.

**C. J. Sullivan** has been appointed di-

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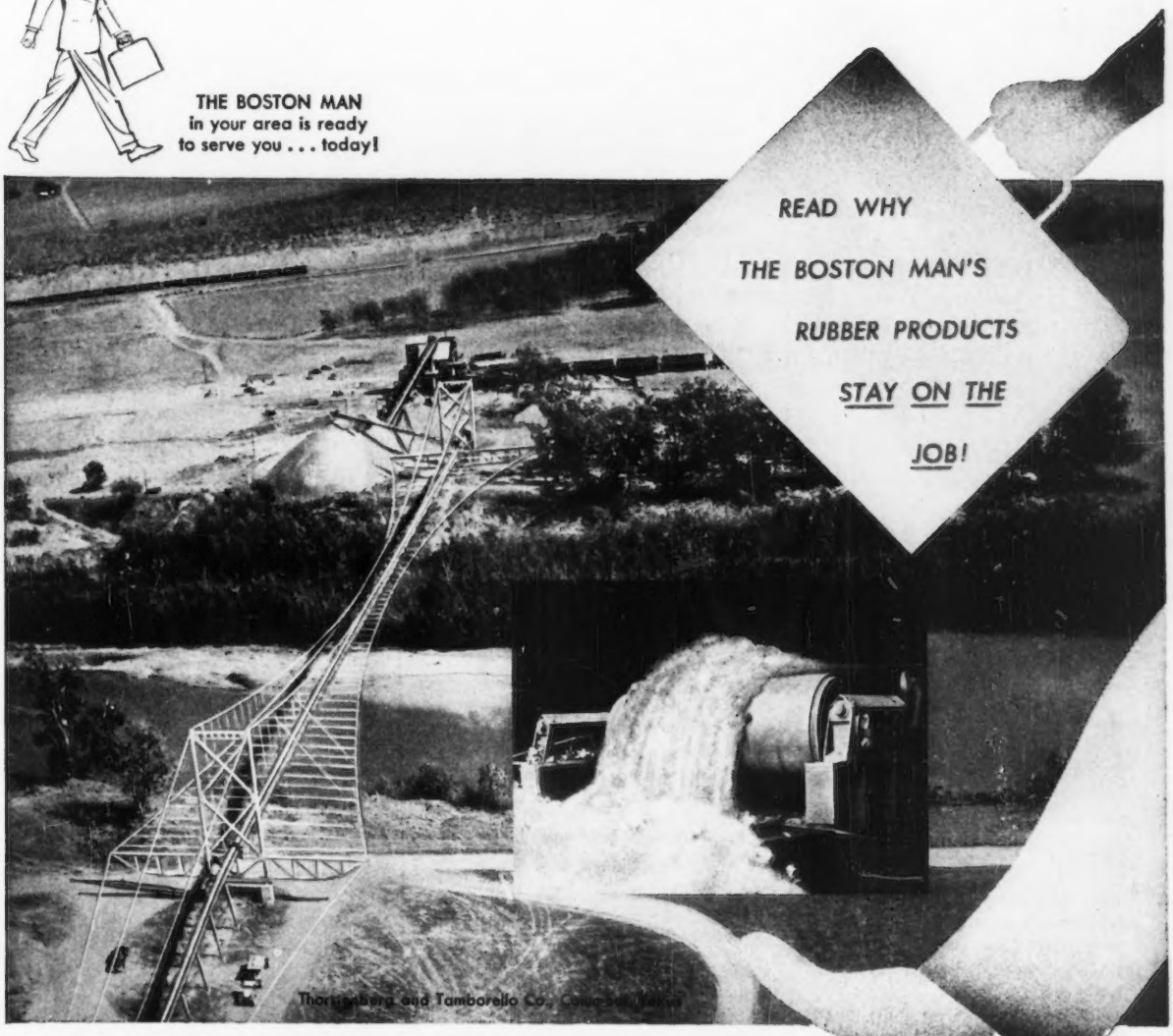


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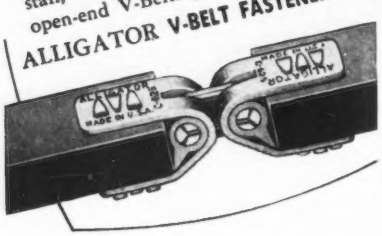

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rector of exploration, Kennco Exploration (Canada) Ltd., Toronto.

**John A. Engstrom,** former unit superintendent at Topia, Durango, Mexico, has been named manager of the Avalos unit of Compania Minera de Penoles, S.A., Mexican subsidiary of American Metal Co., Ltd.

**John P. FitzGibbon** has been appointed assistant secretary of Climax Molybdenum Co. according to an announcement by the board of directors.

**Arthur P. Nelson** has been named general manager of Minas de Matahambre, S.A., succeeding **George R. Schaefer,** who resigned.

**K. N. Banthin** has been elected to the position of secretary-treasurer of the Plant Engineers' Society of Chicago.

**W. Monroe Wells,** Richmond, Va.; **J. C. Black,** Hot Springs, Ark.; **W. W. Binford,** Little Rock, Ark.; and **E. J. Appel,** Portland, Ore., have been named vice presidents of Reynolds Reduction Co.

**Philip W. Chase** has been named assistant vice president, raw materials, of the U.S. Steel Corp. He succeeds **H. D. Moulton,** new president of U.S. Steel Homes. **August J. Breitenstein** has been appointed director, exploration and planning, succeeding Mr. Chase.

**W. E. Colm,** after seven years with Overseas Metal & Ore Corp, of New York, is now in Flagstaff, Ariz., where he is serving as vice president of A and B Mining Corp., Penn-Uranium Corp., and Pentex Uranium Corp. Mr. Colm is representing Penn-Texas Corp. in the uranium mining field and is in charge of operations of the producing mines.

**Joseph C. Schumacher** has joined American Potash and Chemical Corp. as director of research.

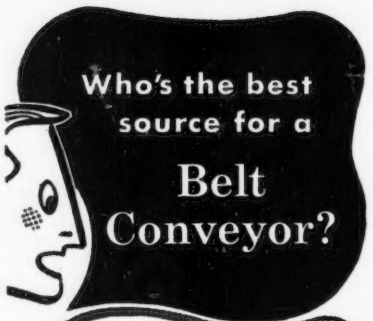
**John L. Boardman,** chairman of safety committee, Anaconda Copper Mining Co., is chairman of the National Safety Council's campaign for the prevention of accidents from falls of ground.

**Frank McCarthy** is now engaged in reopening the lower levels of the Boreani mine, wolframite and scheelite producer, Yucca, Ariz.

Faculty additions to the Colorado School of Mines, Golden, Colo., are: **Dr. H. Gordon Poole,** head of the department of metallurgy; **Douglas W. Bainbridge,** assistant professor of metallurgy; **Hildreth Frost, Jr.,** instructor in metallurgy; and **Howard L. Hartman,** assistant professor of mining.

**Carl Lo Conto,** Boise, Idaho, and **Roy Walton,** Bozeman, Mont., have reported the discovery of uranium-bearing ore on their claim 14 mi southwest of Bozeman. It is the first discovery of that nature in Gallatin County.

**Frank Wallene,** M. A. Hanna ore grader, has been transferred to Seven Islands, Que., where he will be assistant ore grader for Iron Ore Co. of Canada.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# Engineering and Mining Journal

# 1954

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JANUARY TO DECEMBER

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# Engineering and Mining Journal

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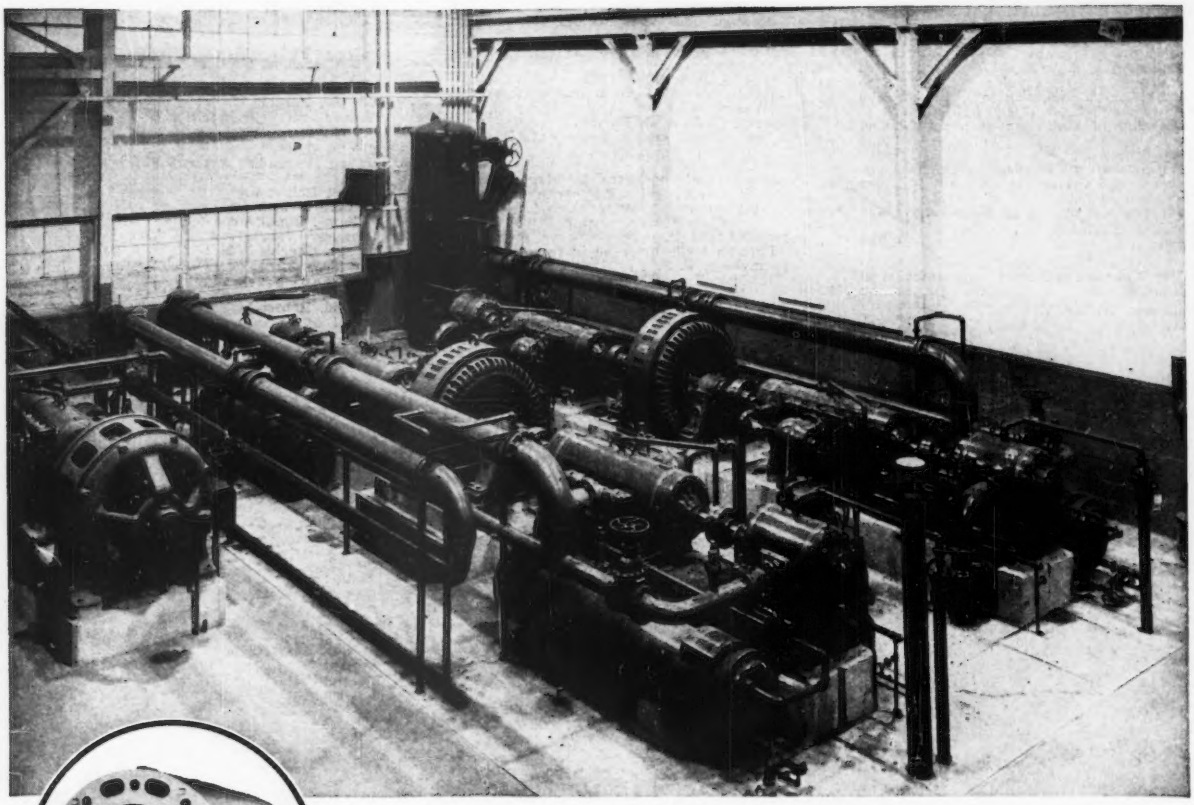

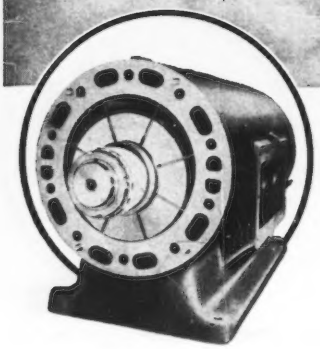

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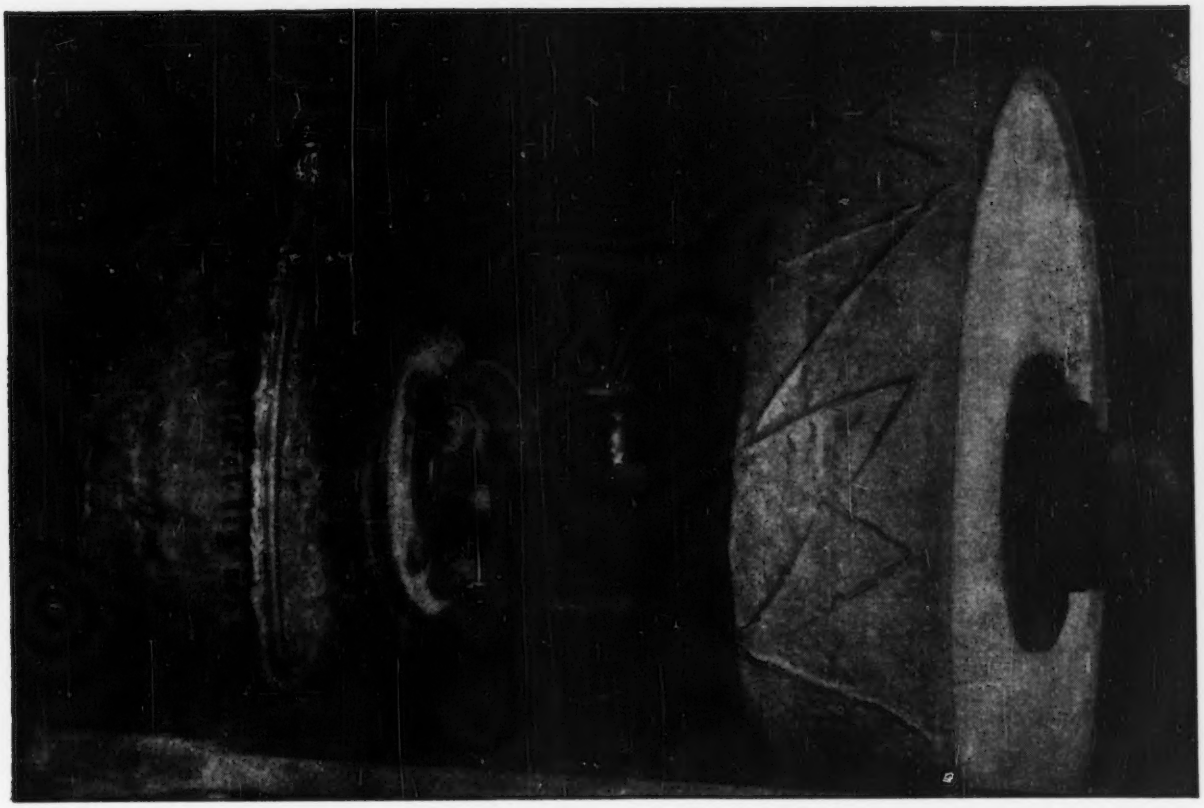

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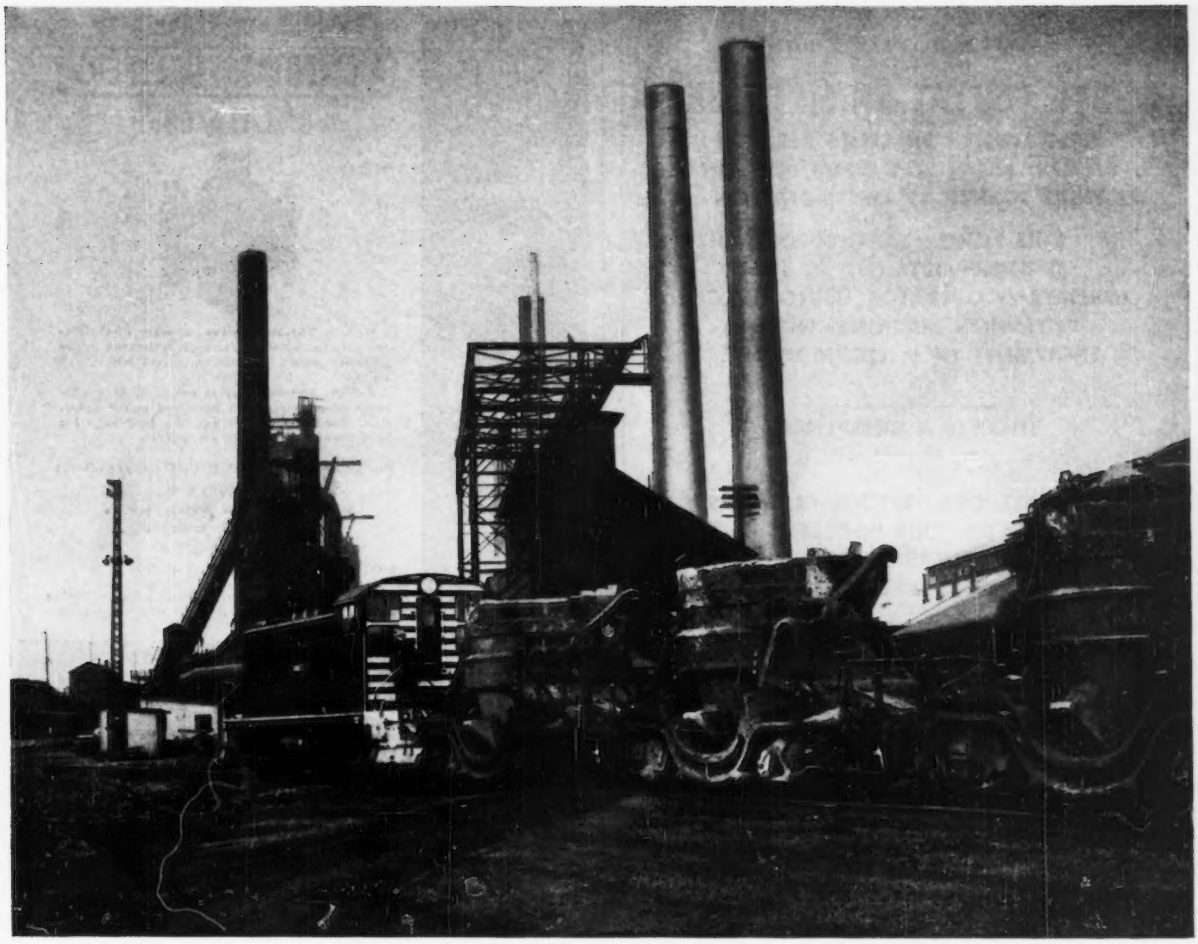

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The use of six continuously operating Baldwin diesel switching locomotives by the Sharon Steel Corporation at their Roemer Works reduced operating costs. Here is Sharon Steel's report:

"We have found that operating costs are lower with the Baldwin diesels than they were with steam locomotives.

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**INDUSTRIAL LOCOMOTIVES**

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**BOOTH FLOTATION MACHINES**

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THIS LOWER TAILING LOSS
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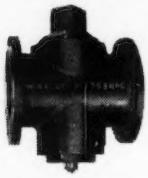

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McNally Pittsburg valves are made in a wide range of sizes for both hand and motor operation. Recommendations for the best type for your needs will be made on request.

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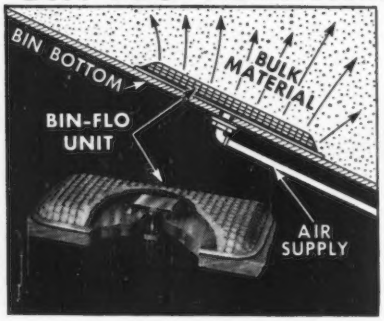


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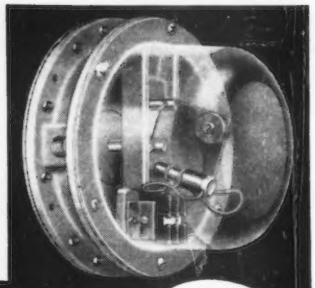

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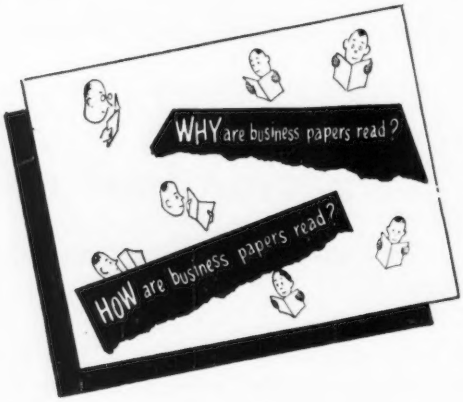


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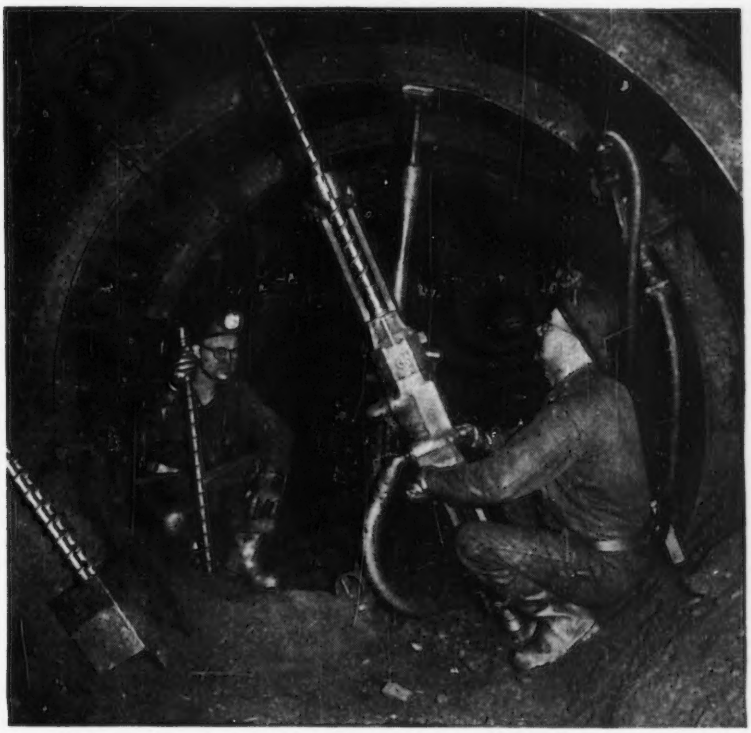

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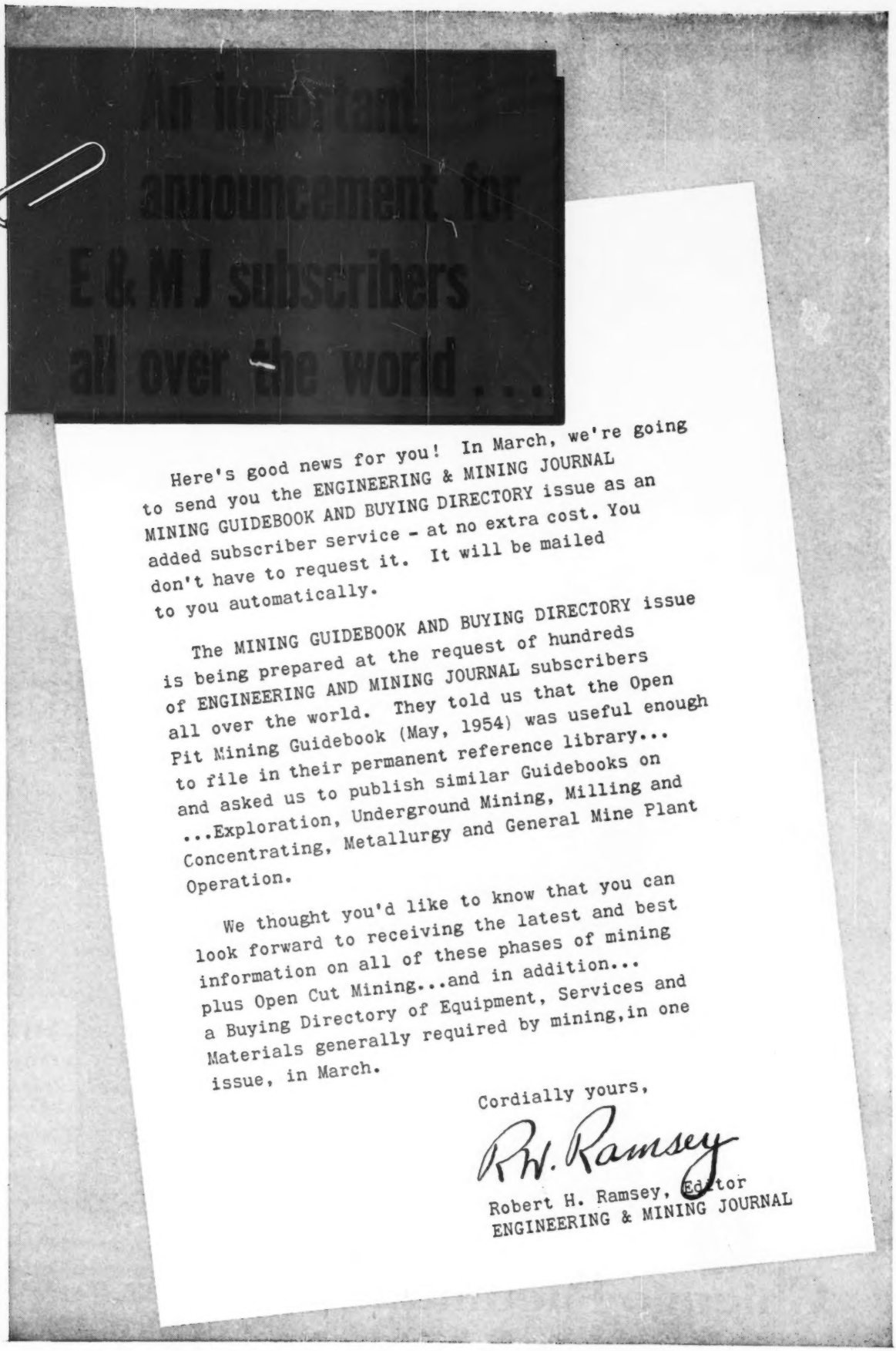


Here's good news for you! In March, we're going to send you the ENGINEERING & MINING JOURNAL MINING GUIDEBOOK AND BUYING DIRECTORY issue as an added subscriber service - at no extra cost. You don't have to request it. It will be mailed to you automatically.

The MINING GUIDEBOOK AND BUYING DIRECTORY issue is being prepared at the request of hundreds of ENGINEERING AND MINING JOURNAL subscribers all over the world. They told us that the Open Pit Mining Guidebook (May, 1954) was useful enough to file in their permanent reference library... and asked us to publish similar Guidebooks on ...Exploration, Underground Mining, Milling and Concentrating, Metallurgy and General Mine Plant Operation.

We thought you'd like to know that you can look forward to receiving the latest and best information on all of these phases of mining plus Open Cut Mining...and in addition... a Buying Directory of Equipment, Services and Materials generally required by mining,in one issue, in March.

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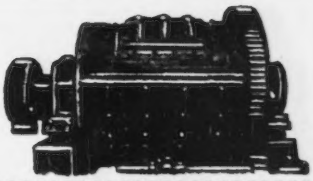

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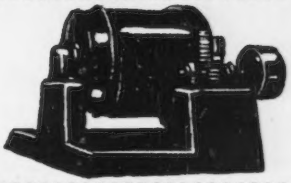

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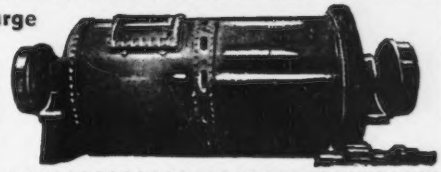

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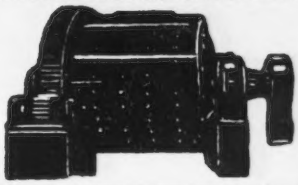

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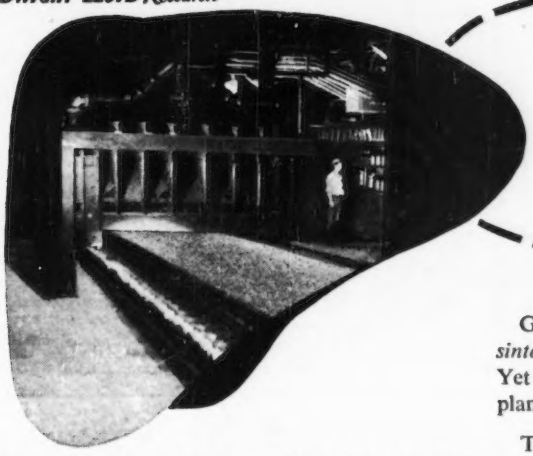

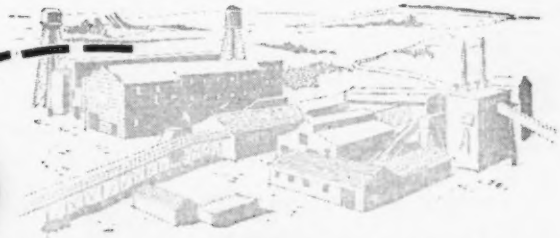

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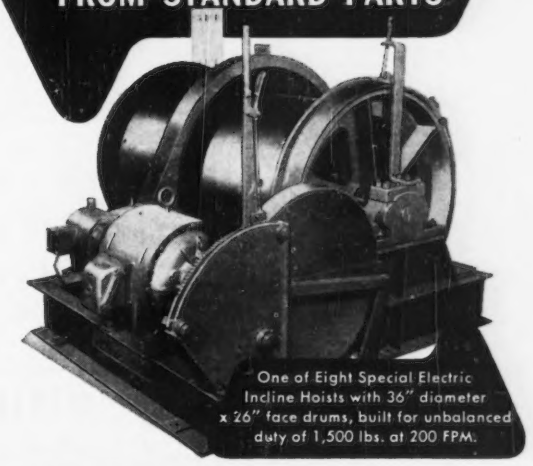

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Duties are to be assumed on the 1st July, 1955, or as soon as possible thereafter. Applicants are advised to obtain the information sheet giving more details in regard to this vacancy from the Registrar, University, Milner Park, Johannesburg, South Africa, with whom applications should be lodged not later than the 31st January, 1955.

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**The applicant must have had considerable experience, an appreciable part of which should have been in the pyrometallurgy of copper and preferably include the operation of reverberatory type furnaces.**

**A thorough knowledge of sampling and sample preparation of ores, concentrates and smelter products is needed.**

**Interest and competency in both metallurgical development and control of plant processes is needed.**

**The salary to be offered will be commensurate with the successful candidates qualifications and experience, with the minimum of £1,500 per annum. There is a cost of living allowance of £5.10.0 at present and a copper bonus, based on the difference between the cost of production and the selling price of copper, and at present 60% of basic salary, is paid monthly. Housing is provided, with basic furniture, at a nominal rental. The Corporation will pay the cost of first-class transportation for the successful candidate and his immediate family, including children up to the age of 18 years, to Kitwe, Northern Rhodesia.**

**Applications stating age, marital status, qualifications, experience, record and availability should be addressed to: The General Manager, Box 137, Kitwe, Northern Rhodesia.**

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**P4682 Engineering & Mining Journal**
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*(continued on opposite page)*

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1—2-2½ ton Whitcomb, 24" gauge
1—2½ ton Jeffrey, 36" gauge
2—3½ ton Mancha, 18"-32" gauge; with 2 sets Edison batteries
1—3½ ton Atlas, 24" gauge
1—4 ton Westinghouse, 24" gauge
1—4 ton Ironton, 36" gauge
2—6 ton General Electric
1—6 ton Mancha Trackmaster, 24" gauge, with 2 sets Gould KMZ-21 batteries
2—7 ton General Electric, 36" gauge, permissible
1—7 ton Atlas, 36"-48" gauge
2—8 ton General Electric, 36" gauge
2—8 ton Goodman, 36" gauge
3—8 ton Ironton, 24"-48" gauge
4—10 ton Atlas, 36" gauge

### TROLLEY LOCOMOTIVES

1—4½ ton Goodman, 36" gauge
1—5 ton Jeffrey, 36" gauge
2—5 ton Jeffrey, 42" gauge
1—6 ton Goodman, 36" gauge
1—8 ton Goodman, 42" gauge
2—8 ton Goodman, 42" gauge
3—10 ton Jeffrey, 42" gauge
1—13 ton Goodman, 42" gauge
1—13 ton Jeffrey, 42" gauge
3—15 ton Jeffrey, 42" gauge

### FILTERS

1—3' x 3' Oliver drum filter
2—4' x 8' Eimco drum filter
1—6' x 2 disc Oliver leaf filter
1—8' x 3 disc American leaf filter
1—18" Morse round pattern filter press
1—36" Merrill triangular filter press
1—#12 Sweetland filter press

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3—2" New Morse Diaphragm Pumps
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1—2" Dorrco Duplex Pump
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1—4" Barnes Pump
2—4" Butchart Pumps
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1—10 HP Vulcan #0 Single Drum
1—115 HP Morse New Single Drum
1—20 HP H&B Single Drum
1—22 HP Vulcan Single Drum #1½
1—30 HP Vulcan Double Drum
1—30 HP Vulcan Single Drum
1—37 HP Single Drum
2—52 HP Vulcan #4½ Single Drum
1—50 HP Fairbanks-Morse Single Drum
1—60 HP Vulcan #23ELF Single Drum
4—100 HP Box Single Drum
1—112 HP Vulcan Single Drum
2—150 HP Vulcan Single Drum
1—375 HP Dillon-Box Single Drum
1—22 HP Vulcan #1½ Double Drum
1—60 HP Ottumwa Double Drum
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1—80 HP Thomas 3 Drum
1—80 HP Lidgerwood
1—80 HP Clyde 3 Drum

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4—2¼" x 3½" New Morse Lab Jaw Crushers
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1—9" x 15" Wheeling Jaw Crusher
1—9" x 15" Farrell Jaw Crusher
1—8" x 24" Rogers Jaw Crusher
1—11" x 18" Universal Jaw Crusher
1—24" x 13" Farrell Jaw Crusher
1—10" x 16" Hercules Jaw Crusher
1—10" x 16" Universal #3M Jaw Crusher
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2—Eimco model 21 loaders
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1—447 CFM Ingersoll-Rand
1—637 CFM Sullivan
1—698 CFM Union
1—800 CFM Ingersoll-Rand
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1—1418 CFM Ingersoll-Rand

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1—105 CFM Worthington, gas engine driven
1—210 CFM Worthington, continental gas engine
1—230 CFM Gardner-Denver stationary, Buda gas engine
1—310 CFM Sullivan, Buda gas engine
1—310 CFM Gardner-Denver stationary, Buda gas engine

### TUGGER HOISTS

1—D6U Ingersoll-Rand Utility Air Hoist
1—6HC Ingersoll-Rand Air Hoist
1—Sullivan Model G-112, driven by 15 HP Wisconsin gas engine

### SLUSHER HOISTS

1—7½ HP Sullivan 2 Drum Slusher
1—10 HP Sullivan 3 Drum Slusher
1—Sullivan 2 Drum Model HD-10-B, driven by [illegible] HP Continental gas engine

### BALL AND ROD MILLS

1—4' x 3' Marcy Ball Mill
1—4' x 3' Morse Ball Mill
2—6' x 48" Hardinge Conical Ball Mills
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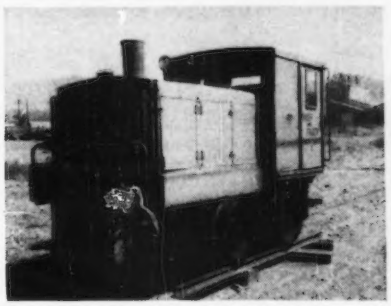

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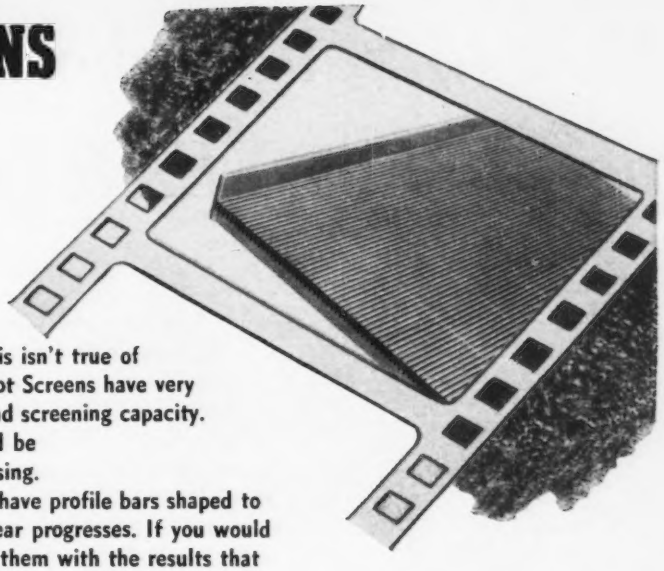
# Give Your SCREENS a screen test



One sure way of testing the dewatering qualities of a screen is to run water over it. Nine times out of ten you'll find the screens with the best dewatering qualities have openings too large for profitable material retention. But this isn't true of Hendrick Wedge-Slot Screens. For Wedge-Slot Screens have very small openings yet have far greater draining and screening capacity. And they retain material that ordinarily would be wasted or cause expensive delays for reprocessing.
That's not all! Hendrick Wedge-Slot Screens have profile bars shaped to maintain uniform width of slot openings as wear progresses. If you would like to give your screens a test, then compare them with the results that can be obtained from Hendrick Wedge-Slot Screens, call your nearby Hendrick representative or write Hendrick direct.

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# *How to handle more material per dollar—YEAR AROUND*

THIS Caterpillar No. 6 Shovel has no chance to loaf. It's shown here cutting down a bank of dirt and loading it for road-building fill at Scott County Stone Co., Inc., Scottsburg, Indiana. In addition, it stockpiles and loads crushed rock—keeping busy the year around, no matter what the weather or the ground conditions.

Many owners of No. 6 Shovels also use them for stripping and loading overburden, grading, excavating and cleaning up. Underground, its low over-all height, freedom from overhead clutter, and turning ability enable the No. 6 to put out plenty of work in tight places. With its long bucket reach, the No. 6 Shovel easily loads high-sided hauling units.

One reason for the high work capacity of the CAT* No. 6 Shovel is its carefully engineered balance. Weight distribution, horsepower and bucket capacity are matched so that with capacity loads the tracks are on the ground providing traction from sprockets to front idlers. Another reason: the two-yard bucket tips back 35 degrees in the first few feet of upward travel after loading, so it retains a heaping load of even loose materials, and dumps *clean*.

Bucket controls are well-placed and designed for easy, accurate operation. Ralph B. McNeely, operator of the shovel in the picture, says, "I can do a big day's work with little effort. This machine is powerful, easy to handle, and has good visibility at all times." This fast and easy operation cuts costs. Further savings result from the ability of the rugged Cat Diesel Engine to deliver full and *foul-free* power for only pennies per hour on inexpensive No. 2 furnace oil, thanks to its exclusive, Caterpillar-built fuel injection system.

Your Caterpillar Dealer will demonstrate *on the job* the shovel that will do the most work for *you* at lowest cost. See him today. And count on him whenever you need skilled service and genuine Caterpillar parts.

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# ROCK RATED

## before it ever reached the pit!

Look at the development behind the P&H Model 1055 and you see why this 3½-yd. shovel can outproduce machines of greater rated capacity.

It's the one rock shovel built completely from progressive ideas. P&H was first with the added strength of welded steel construction . . . the pioneer in better weight distribution to let you use full digging power at tooth point . . . the leader in cushioned hydraulic control. And it's P&H with revolutionary Magnetorque* that swings you through a faster, smoother cycle in any kind of weather. Count on *15% additional rock production* from this P&H advancement alone!

There's a companion P&H 955A Shovel in the 2½-yd. class equally as outstanding. Write today for further facts about either model.

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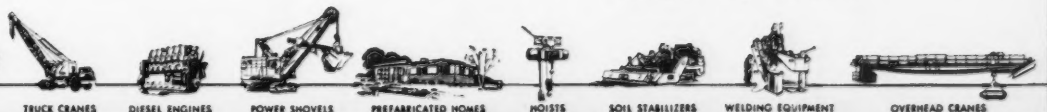


# Gouges 42" hole through 190' of coal

## *with TIMKEN® bearings taking the load*

THIS McCarthy coal recovery drill bites its way through 190 feet of tough coal. The power needed to cut through the coal is supplied to the auger by a rugged gear drive.

The loads on these gears are heavy and complex—so Salem Tool Company, manufacturers of the McCarthy coal recovery drill, mounts all gear shafts on Timken® tapered roller bearings.

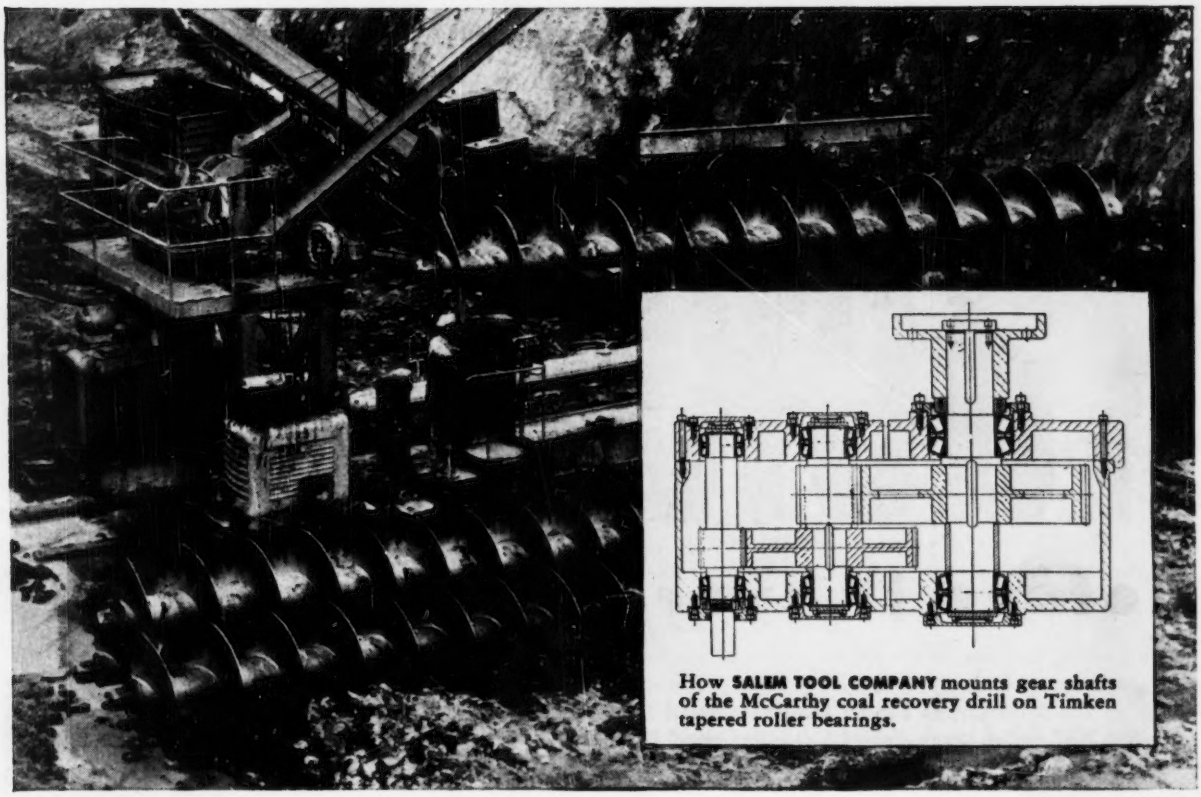
Timken bearings can take the heavy loads because line contact between their rollers and races provides extra load-carrying capacity.

The bevel gears in the drive exert both a radial and a *thrust* load. But, the tapered design of Timken bearings enables them to take both radial and thrust loads in any combination. No extra thrust devices are required. Despite the heavy, grinding loads on these gears, Timken bearings keep them in accurate alignment. This helps insure long life and trouble-free performance.

Dirt and dust can be a big problem in applications like this. But Timken bearings are built to close tolerances; they keep the gear shafts concentric with their housings making bearing closures more effective. Lubricant stays in; dirt, dust and moisture stay out.

When you buy or build equipment, always look for the trade-mark "Timken" on the bearings. It's a sure sign of quality. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

*This symbol on a product means its bearings are the best.*





How **SALEM TOOL COMPANY** mounts gear shafts of the McCarthy coal recovery drill on Timken tapered roller bearings.

**WE MAKE OUR OWN STEEL**

The special grade alloy steel which gives Timken bearings their strength and resistance to wear is made in our own steel mills.

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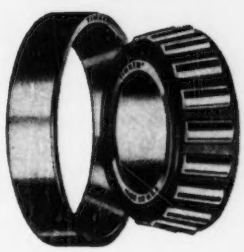
**TAPERED ROLLER BEARINGS**



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